EMBER, 1944

TOOL & DIE JOURNAL

TOOLING AND PRODUCTION

PUTNAM OFFERS THE COUNTRY'S
RGEST AND MOST COMPLETE LINE OF

End Mills

Many new Putnam end mill items have been added . . . size ranges on others extended . . . so that, today, nowhere will you find so complete a line of end mills as Putnam offers you. And, even more important, all of these standard Putnam Hi-Speed End Mills are available to you right from stock . . . either on dealers' shelves or at our factory . . . ready to be shipped you immediately on your order.

You can depend upon Putnam Hi-Speed End Mills to deliver top cutting performance always. Why be satisfied with less when you can get the best without delay?

Send for your new 92 pp. Putnam catalog—it's free! Requests must be made on company letterheads.

NAVY

PUTNAM TOOL COMPANY

2985 CHARLEVOIX AVE. • DETROIT 7, MICH.

In this method **DIE MAKING**

YOU REDUCE

COSTS

FCC Cast-To-Shape, the modern method of tool and die making, is effecting important savings of time, trouble and money for an increasing number of manufacturers.

Even very intricate shapes can now be cast successfully within an eighth inch of finished size. This means that you buy less steel at the start and reduce machining costs substantially.

Tools which could not be made by conventional methods except in sections can often be fabricated from FCC Cast-To-Shape blanks in a single piece.

In many instances performance of the tool is better than can be obtained by fabrication from bar stock or forgings.

Particulars are available through Allegheny Ludlum representatives; or write for the booklet today.

WRITE FOR THIS BOOKLET

It gives you details of FCC. Air Hardening, Oil Hardening and other Cast-To-Shape Tool Steels and describes other FCC money-saving Tool Steel Specialties. Get your copy—write for it today.

ADDRESS DEPT. TD-31

Allegheny Ludlum
STEEL CORPORATION
Forging and Casting Division
Detroit 20, Michigan

W & D . . . 9642-B

HARDINGE

High Speed Precision

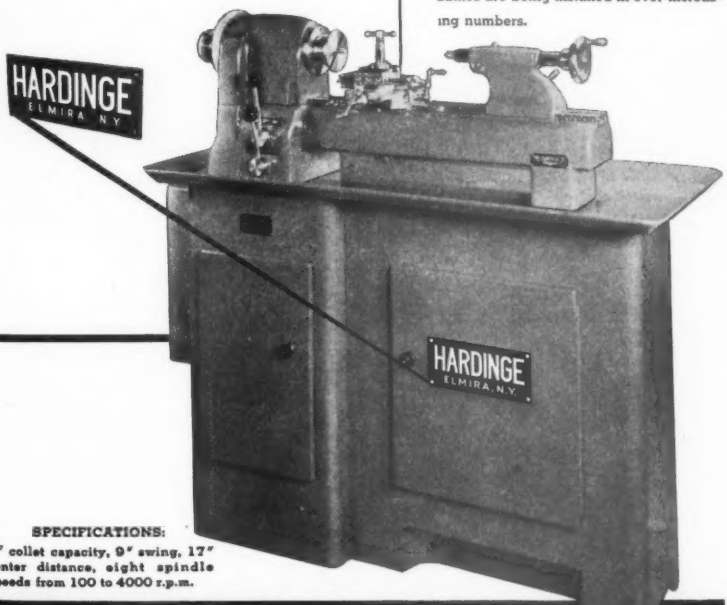
LATHE

is designed for accurate tool room work

Designed to meet requirements of extreme lasting accuracy, high spindle speeds and the ease in operation required for the smaller diameter work range found in every tool room, laboratory and production department.

The simplicity of operation enables relatively unskilled operators to produce parts to the necessary close limits without expensive tooling. Your larger, expensive equipment will not meet all of the foregoing requirements necessary for practical results and proper economy.

Because of the many advantages found through actual use, Hardinge Precision Lathes are being installed in ever-increasing numbers.



SPECIFICATIONS:
1" collet capacity, 9" swing, 17" center distance, eight spindle speeds from 100 to 4000 r.p.m.

"PERFORMANCE HAS ESTABLISHED LEADERSHIP FOR HARDINGE"

In this method **DIE MAKING**

YOU REDUCE

COSTS

FCC Cast-To-Shape, the modern method of tool and die making, is effecting important savings of time, trouble and money for an increasing number of manufacturers.

Even very intricate shapes can now be cast successfully within an eighth inch of finished size. This means that you buy less steel at the start and reduce machining costs substantially.

Tools which could not be made by conventional methods except in sections can often be fabricated from FCC Cast-To-Shape blanks in a single piece.

In many instances performance of the tool is better than can be obtained by fabrication from bar stock or forgings.

Particulars are available through Allegheny Ludlum representatives; or write for the booklet today.

WRITE FOR THIS BOOKLET

It gives you details of FCC Air Hardening, Oil Hardening and other Cast-To-Shape Tool Steels and describes other FCC money-saving Tool Steel Specialties. Get your copy—write for it today.

ADDRESS DEPT. TD-31

Allegheny Ludlum
STEEL CORPORATION
Forging and Casting Division
Detroit 20, Michigan

W & D . . . 9642-B

HARDINGE

High Speed Precision

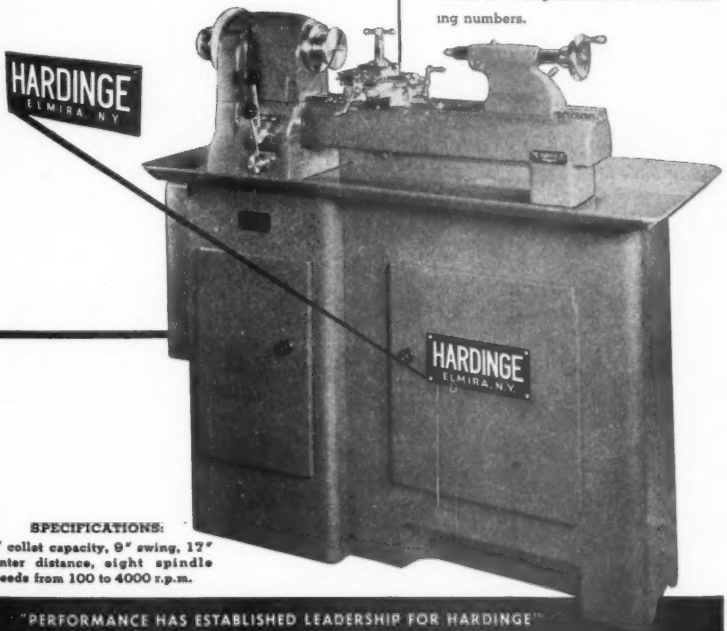
LATHE

is designed for accurate tool room work

Designed to meet requirements of extreme lasting accuracy, high spindle speeds and the ease in operation required for the smaller diameter work range found in every tool room, laboratory and production department.

The simplicity of operation enables relatively unskilled operators to produce parts to the necessary close limits without expensive tooling. Your larger, expensive equipment will not meet all of the foregoing requirements necessary for practical results and proper economy.

Because of the many advantages found through actual use, Hardinge Precision Lathes are being installed in ever-increasing numbers.



SPECIFICATIONS:
1" collet capacity, 9" swing, 12" center distance, eight spindle speeds from 100 to 4000 r.p.m.

"PERFORMANCE HAS ESTABLISHED LEADERSHIP FOR HARDINGE"

THE TOOL & DIE JOURNAL

GEORGE J. HUEBNER • EDITOR, PUBLISHER

Technical Editor, E. WILLARD PENNINGTON — Assistant Editor, PAUL L. REED

Contents

Vol. X, No. 9 — December, 1944

Feature Articles Index 85
Editorial, George J. Huebner 87
Feature Articles 89
Industrial Plastics 109
Progress-on-Parade 129
Industrial Digest 139
Publication Previews 155
Shop Aids 203
Advertisers' Index 233

The Tool & Die Journal is published monthly for those industry key men who are responsible for designing, building and using precision tooling

Controlled Circulation — CBI Coverage • Official Publication: Tool & Die Institute

PUBLICATION OFFICE

2460 Fairmount Boulevard, Cleveland 6, Ohio

CATHRYN H. EVANS, Business Manager — MARY D. VECCIA, Production Manager

REGIONAL ADVERTISING OFFICES

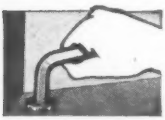
Detroit 2.....R. F. Pickrell, 314 Stephenson Bldg.....TRinity 1-0790
Chicago 2.....L. B. Hammond, 123 W. Madison St.....RANdolph 1843
New York 17.....H. Thayer Heaton, 415 Lexington Ave.....MUrray Hill 2-1647
Cleveland 15.....L. D. Orner, 801 Caxton Bldg.....MAin 8719
New England.....R. J. Weeks, 420 Lexington Ave., New York 17.MUrray Hill 4-7752
California.....M. D. Pugh, 2989 Lincoln Ave., Altadena.....SYcamore 7-2894

Copyright 1944 by Geo. J. Huebner

Acceptance under the Act of June 5, 1934, authorized October 22, 1942

In Tomorrow's Blueprints Too!

Design and Production Engineers, in addition to their war-time activities, find time to blueprint future plans in preparation for the day they can be put into production. Machines and parts which will be required to sustain unusual stresses and vibrations must have their component parts securely fastened. Now is the time to investigate — prepare for tomorrow's production today!



INTERNAL WRENCHING FEATURE - QUICK & POSITIVE TIGHTENING

SOCKET SCREWS

The BETTER Fastening Method

Design and Production Engineers find the assistance given by Holo-Krome Fastening Engineers extremely valuable in planning their production schedules. Holo-Krome FIBRO FORGED Socket Screws, Completely Cold Forged by the Holo-Krome patented method, do the job for which they are intended with Guaranteed Unfailing Performance.

Catalog of Holo-Krome Products Gladly Sent.

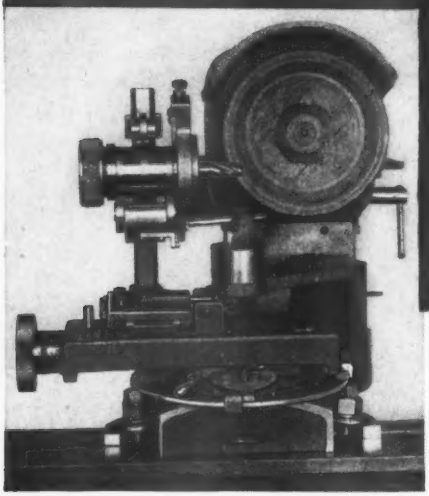
HOLO-KROME
***fibro forged* SOCKET SCREWS**

Manufactured Exclusively by
THE HOLO-KROME SCREW CORP.
HARTFORD 10, CONNECTICUT, U. S. A.

NEW ATTACHMENT
GENERATES RADII ON END MILLS
WITH MEYERS

Radiform
TRADE MARK REG.

WHEEL AND
TOOL
FORMER



Simple, sturdy construction of Meyers Radiform insures fast operation and long, trouble-free performance.

* * *

Pat. Pending

Meyers Radiform Attachment for generating predetermined precision radii on spiral fluted end mills without previous wheel forming. Other Radiform attachments available for supporting tool bits, milling cutters, die sinking tools and other forming tools to be generated directly against a grinding wheel. Time and cost of forming wheels is eliminated.

Write, wire, or call for illustrated catalog and prices

W. F. MEYERS COMPANY • INC.
Established 1883
1013 FOURTEENTH STREET • BEDFORD, INDIANA

The mark of a GOOD File

FORD—America's oldest manufacturer of rotary files and cutters—producer of the COMPLETE line—devote their entire attention to the one job of making better rotary cutting tools. Write today for complete information.

M. A. FORD MFG. CO., INC.

739 W. First Street • Davenport, Iowa

HAND CUT FILES • GROUND FROM SOLID CUTTERS • CARBIDE CUTTERS

ANOTHER NEW SERVICE BY "CARBORUNDUM"

THE GRINDING WHEEL THAT SPEAKS FOR ITSELF!

MORE THAN A LABEL, THIS NEW BLOTTER TELLS THE WHOLE STORY AT A GLANCE!

From now on, it's going to be easier than ever to pick the right wheel for the job—all grinding wheels by "CARBORUNDUM" will carry this new wheel blotter . . . makes identification *quicker* and easier. A glance tells you why.

1 **Easier to use.** All the information you need is on one side of the blotter (see large picture opposite page). And to make it even easier to pick the correct grading, it lists both the old wheel markings and the new markings.

2 **Easier to recognize.** The bright red color says it's a wheel by "CARBORUNDUM", clear across the shop! It's further identified by the display side of the blotter. (See small picture opposite.) Even when the wheel is mounted on the machine, and the blotter is covered, the little black mark on the blotter margin identifies it as a product by "CARBORUNDUM".

3 **Easier to read.** The new blotter resists scuffing, and the heavily inked surface remains more legible, even when soiled with grime and grease.

Wheels with the new blotters will be shipped shortly. If you should receive a wheel with the old blotter, it just means that particular wheel was stocked before the new blotters were ready.

THERE IS A PRODUCT BY

CARBORUNDUM

TRADE MARK

FOR EVERY ABRASIVE APPLICATION

("CARBORUNDUM" and "ALOXITE" are registered trade marks of and indicate manufacture by The Carborundum Company)

1 Bright red color ... black mark ... makes identification easier.

2 Information on one side ... Both old and new markings included.

3 Large ink surface more legible even when dirty ... resistant to scuffing.

MAIL COUPON TODAY if you haven't received your free copy of "GRINDING FACTS." It's the new book by "CARBORUNDUM" that explains all about the new wheel markings. It's also full of information on the selection, care and use of grinding wheels!

The Carborundum Company,
Niagara Falls, N. Y. Dept. TD-12

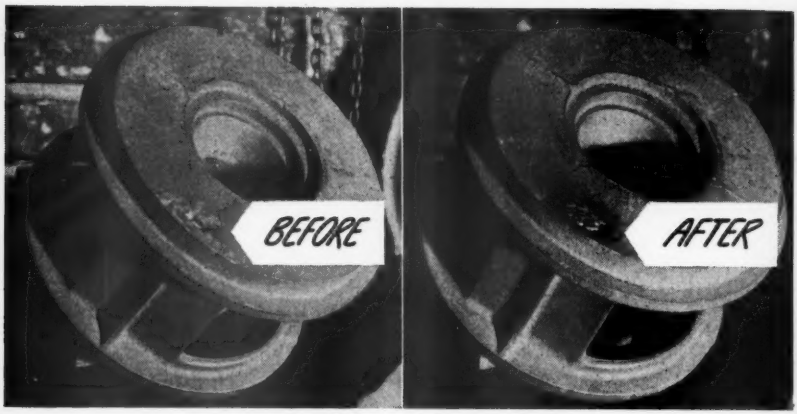
Please send me my free copy of "GRINDING FACTS"

Name.....

Firm.....Title.....

Address.....

YOU CAN MACHINE IT OR DRILL IT ANY WAY YOU LIKE



THE foundry welder knows. Foundries have been using PHILLIPS "600" Electrode for salvaging gray iron castings for years. One good reason why PHILLIPS "600" is the preferred rod for foundry salvage work is that the deposit is completely machinable *even through the line of fusion.*

Further, PHILLIPS "600" deposits are as strong as cast iron and of the same color. Thus, with a very little material and a very few minutes of welding time, castings with small defects are restored, and at only a trifling cost per casting.

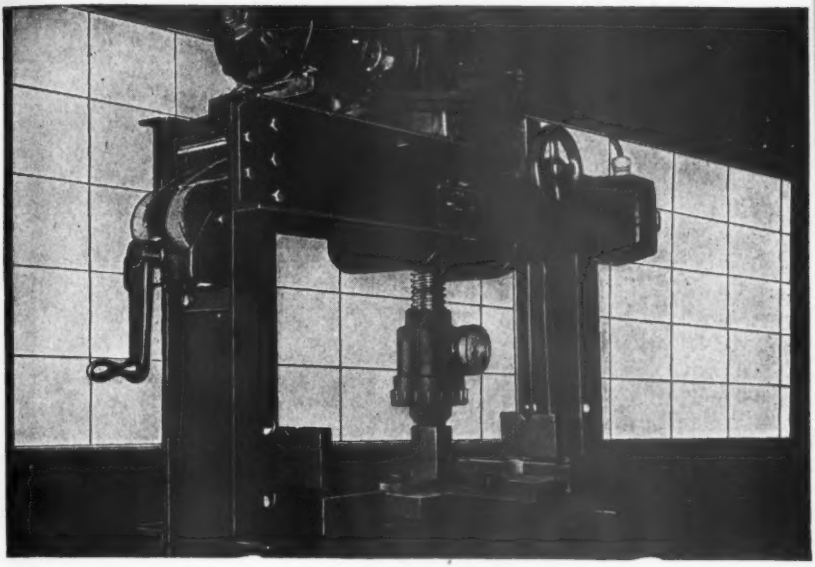
C. E. Phillips and Company carry in stock a complete line of electrodes for salvaging and repairing iron castings. To help you to select the correct electrode for each type of application, and the best procedure for using each electrode, we have prepared the manual of arc welding procedures for cast iron illustrated here. To get the best results on every job it is essential that you follow these practices which have been proved by long experience.

This new manual is a complete guide to the selection of materials and procedures for arc welding cast iron. Send for your copy TODAY.

C. E. PHILLIPS & COMPANY

2750 Poplar Street, Detroit 8, Michigan • 332 So. Jefferson St., Chicago 6, Illinois

MANUFACTURERS AND DISTRIBUTORS OF WELDING ELECTRODES AND SPECIALTIES



MR. MUSCLES . . .

. . . is able to develop a 60 ton pressure in 4 seconds! Or just kiss a press fit into place. Ram is controlled instantaneously by foot pedal switches. Adjustable bolster. Movable ram head. Lempco presses are used in many of the world's leading aircraft plants for assembling, straightening, riveting, die try-outs, and many other operations where accurate duplication of pressures is required.

★ *Electric & Hydraulic Models*

★ *20, 40, or 60 Ton Capacities*

★ *Ceiling-Priced*

★ *Good Delivery*

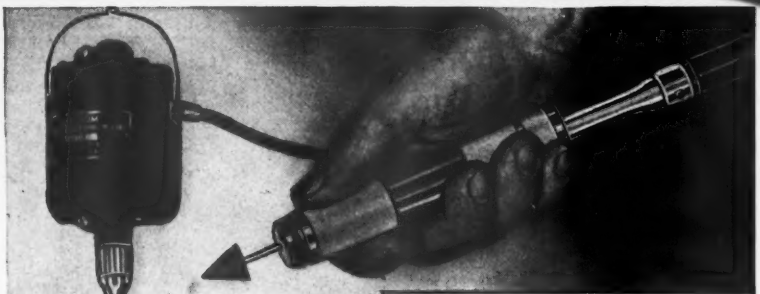
WRITE FOR CATALOG

LEMPCO

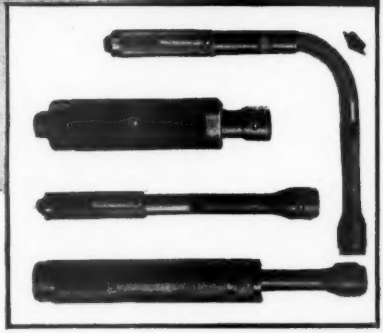
5713 DUNHAM ROAD • BEDFORD, OHIO

EXCLUSIVE AUTOMATIC PRESSURE CONTROL

The regulator hand on the dial gauge may be set to any desired pressure. When this pressure is reached, solenoid control automatically stops the ram. Or it may be set to automatically reverse the ram and repeat the cycle indefinitely until stopped by hand or foot control.



Choice of
AMERICAN INDUSTRY
for DE-BURRING and
LIGHT GRINDING
and FINISHING JOBS



Foredom Machines are employed in many thousands of manufacturing plants for grinding, finishing, polishing, de-burring, milling, cleaning, etc., replacing old-fashioned, time-killing hand methods.

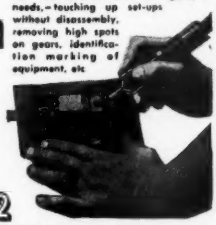
Foredoms are used in 3 key departments—production—tool room—maintenance. Among the leading industrial plants employing Foredoms are Ford, General Motors, Chrysler, Nash-Kelvinator, Jack & Heintz, Sperry Gyroscope, Bendix, Westinghouse, etc.

Models from $17.50 to $48.75. Catalog No. 33 shows complete line and many uses—may point the way to solving some of today's production and maintenance problems. Write for your copy.

4 Quickly-interchangeable hand-piece types—pencil size and larger—some with flexible wrist—see arrow.

For maintenance and emergency needs,—touching up set-ups without disassembly, removing high spots on gears, identification marking of equipment, etc

1



2

In die and tool departments, for grinding, finishing and touching up dies, molds, jigs, etc

3

For de-burring, grinding, finishing, polishing and other light production jobs—particularly valuable on irregularly-shaped parts

Another Foredom Time-Saver

GRINDING KIT

Model 111

One of Foredom's complete line of versatile utility grinding kits preferred by so many plants for emergency and maintenance needs. You too will find it pays to spot them liberally about your plant. Pencil-size handpiece facilitates getting into tight corners for touching-up production set-ups. Complete with accessories $23.50.

Order from your regular Mill Supply House or direct.
FOREDOM ELECTRIC CO., 27 Park Place, N.Y. 7

FOREDOM ELECTRIC COMPANY
27 Park Place, New York 7, N. Y.

Please send us your new catalog No. 33 showing the different uses of Foredom Flexible Shaft Machines.

Name .....
Address .....
City .....
State .....

Now... REASONABLE DELIVERIES ON ALL ELLSTROM GAGE BLOCK SETS

You can now order your set of the famous Ellstrom CHROMIUM PLATED Gage Blocks and we can promise you reasonable delivery. Our stepped up delivery schedule applies to either "Working", "Inspection" or "Laboratory" sets. Just drop us a note asking for precise information.

Yes, all Ellstrom-made Gages are CHROMIUM PLATED to give them very superior wearing qualities. These gage blocks by actual test wear many times longer. It's the finest gage block that money can buy . . . and solidly backed by a family tradition of fine precision gage making.

Ellstrom Chromium Plated Gage Blocks offered individually or in complete sets in three classes: WORKING Sets with guaranteed tolerance of ±.000008" INSPECTION Sets with guaranteed tolerance ±.000004" LABORATORY Sets with guaranteed tolerance of ±.000002".

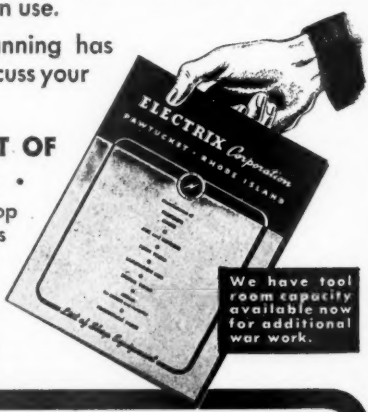
DEARBORN GAGE CO. 22035 BEECH STREET DEARBORN, MICHIGAN

Originators of Chromium Plated Gage Blocks

HOW LONG WILL IT TAKE YOU TO RE-CONVERT?

The speed of your reconversion job is going to depend on how quickly after X-Day tools and parts start rolling into your plant ready for production. That's why it's not too early to place orders with us now, manufacturing to begin immediately following release of materials for civilian use.

However far your post-war planning has progressed, send us prints and discuss your requirements NOW!



WRITE FOR OUR NEW "LIST OF EQUIPMENT" BOOKLET . . .

It lists and illustrates our machine-shop equipment, and pictures precision tools and parts we have made for war industries.

This book is FREE to interested executives. Write for yours—today!

GO PRECISION AUTHENTICATORS NO-GO

JIGS and FIXTURES • FORM TOOLS • SPECIAL TOOLS • LAMINATION DIES • SMALL PARTS and ASSEMBLIES • SPECIAL GAGES • MOLDS

ELECTRIX *Corporation*

156 MIDDLE STREET, PAWTUCKET, R. I.

New Micrometer Accuracy

WITH SAV-WAY MASTER SETTING AND CHECKING ROLLS

Every Mechanic Needs This Set

Every production man knows that precision tools and inspection devices are only as accurate as the methods and gages by which they are checked and set. When anvils are worn unevenly, flat gage blocks may not be adequate. This Sav-Way set of Master Setting and Checking Rolls provides for the first time a really accurate means of checking micrometers, and other types of gages under all conditions of wear. The set consists of 20 rolls, ranging from .100" to 2.000" diameter. Rolls are hardened, ground, and lapped to X gage tolerance. The set is housed in a modern, transparent, plastic case.

A new micrometer instruction book full of valuable technical information will accompany each set.

CLIP THIS COUPON TO YOUR LETTERHEAD

SAV-WAY INDUSTRIES
Box 117, Harper Sta., Detroit 13, Mich.

Please send me illustrated literature on the Master Setting and Checking Rolls.

Name_____

Street and No._____

City_____

State_____

Sav-Way INDUSTRIES
Products Division

BOX 117, HARPER STATION, DETROIT 13, MICHIGAN

For your information:

Engineering Data
on
Precision Broaching Tools

YOU will want this Brochure because it contains technical information about broaching tools plus a picture story (in natural color) showing how they are manufactured. If you are planning for post-war production it will more than pay you to send for your free copy today. Please make request on your company stationery.

REMEMBER: Broaching is the fastest metal cutting process that roughs and finishes to precision limits.

U.S. BROACH Company

USB 6466 E. SEVEN MILE ROAD DETROIT 12, MICH.

TELEPHONE TWINBROOK 1-2211

MO

Introducing

STAR-MO M-2

TUNGSTEN-MOLYBDENUM HIGH-SPEED STEEL

(M-2 ANALYSIS)

During the period of WPB control, Star-Mo high-speed steel conformed to Government requirements, but immediately upon removal of restrictions, late in 1943, an analysis was adopted by Firth-Sterling which was known as "M-2." Since then, all Star-Mo made has been of this new composition approved by leading automotive manufacturers and well-known tool makers. They also adopted the designation "M-2" to describe this type and we included it in the name for this new product —Star-Mo M-2.

STAR-MO M-2 is ***Better.*** On many applications it outcuts and outlasts 18-4-1 high-speed steel—a trial will prove it.

STAR-MO M-2 is ***Cheaper.*** The base price is 14% less than 18-4-1 steels, and in addition Star-Mo M-2 weighs approximately 7% less per foot. May we quote comparative prices?

STAR-MO M-2—is ***Easy to Handle.*** A Firth-Sterling representative will gladly tell you of its value on applications in your plant, methods of heat treatment, and practical use.

ARMY NAVY

Firth-Sterling

STEEL COMPANY

OFFICES: McKEESPORT, PA. · NEW YORK · HARTFORD · LOS ANGELES · CLEVELAND · CHICAGO · PHILADELPHIA · PITTSBURGH · DAYTON · DETROIT

LET *YOUR* TOOLING PROBLEMS BECOME *OUR RESPONSIBILITY*

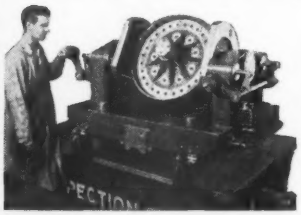
From a small beginning almost 25 years ago this organization has attained a position of prominence in industry.

Its efforts have been devoted primarily to the engineering and production of high-grade precision tools, designing of tools, machines and products—and the development of plans for plant layout, routing, processing, etc.

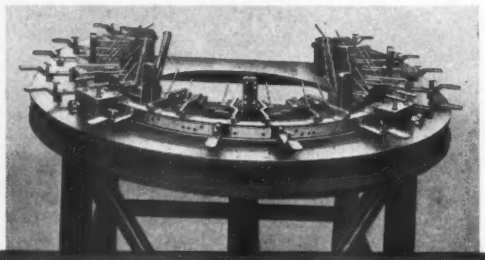
Since before Pearl Harbor this work has pertained largely to tooling for production of vital parts of airplanes, tanks, guns, ships, radar equipment, etc.

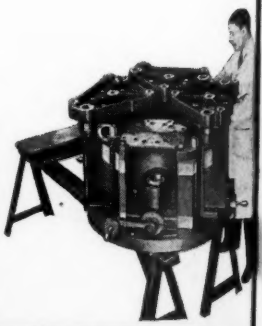
With the completion of some of these large contracts, part of our personnel and facilities are being released to serve a limited number of additional clients.

Get the engineering on new products done now. Be ready to go ahead immediately when permission is given.



Phone or write regarding immediate or impending problems or mail blueprints covering any work on which you need prompt assistance.





NATIONAL HEADQUARTERS

for TOOL ENGINEERING

Complete Engineering Service

• • •

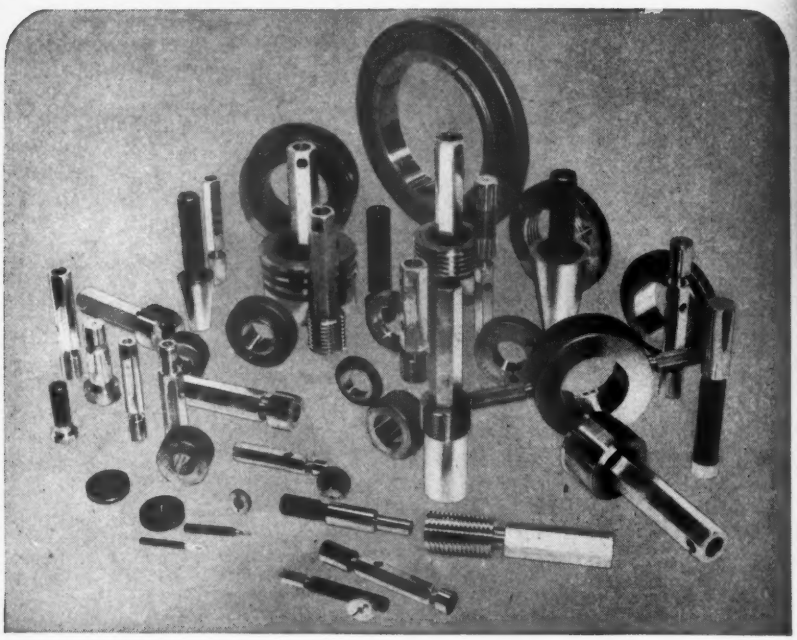
Tools Designed and Manufactured or Built to Your Blueprints

• • •

Custom Machining

McKINNEY TOOL & MFG. CO.
CLEVELAND

DESIGNERS and BUILDERS of PRECISION TOOLING
Since 1920
1673 ARABELLA ROAD



Weapons . . . for both War and Peace

Right now, our industries are working to produce better machines for war—and more of them.

In this effort gages have an important part. They control the accurate dimensions which make modern mass production, with its interchangeability of parts, a practical manufacturing method.

One day—perhaps soon—much of this war production will again return to the making of the products of peace. Again, gages will have an important share in making those products better and more plentiful.

Gages bearing the PM Diamond emblem are ACCURATE. That one word tells the whole story, for accuracy is the only reason for using a gage.

If you use gages, of any type, we'd like to hear from you.

ARMY E NAVY

The PIPE MACHINERY COMPANY Cleveland, O.

GAGES · MULTIPLE THREAD MILLING CUTTERS · SPECIAL TOOLS

. . . YOU CAN OBTAIN 60% TO 80% OF YOUR CARBIDE REQUIREMENTS

Get maximum economy in your carbide tool and blank purchases. Order "catalog" standards and eliminate special drawings, special quotations and delivery delays. Carboloy Catalog GT-175R lists more than 300 standards designed to cover 60% to 80% of your machining requirements. Available at "mass production" prices in any quantity. Wide selection of styles, sizes and grades for cutting steel, cast iron, non-ferrous metals and non-metallics.

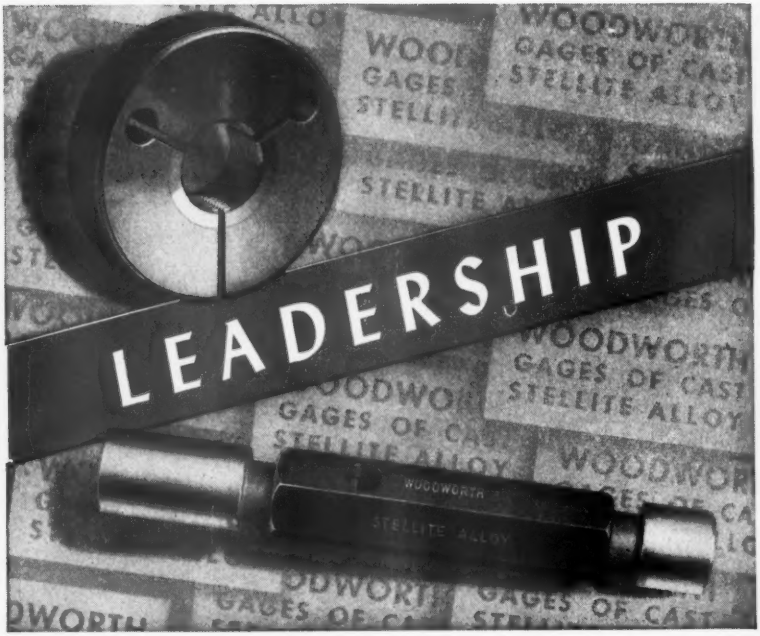
SEND FOR CATALOG GT-175-R *Today*

CARBOLOY COMPANY, INC.
11109 E. 8 Mile Street, Detroit 32, Michigan
CHICAGO • CLEVELAND • HOUSTON • LOS ANGELES • MILWAUKEE • NEWARK
PHILADELPHIA • PITTSBURGH • THOMASTON

CARBOLOY

For Cutting CAST IRON and Non-Ferrous Metals — For Cutting STEEL

TUNGSTEN CARBIDES . . . TUNGSTEN CARBIDES WITH TANTALUM AND/OR TITANIUM CARBIDES



From the day of their introduction to industry, gages of Stellite Cast Alloy by Woodworth have been earmarked for leadership. Today these tough, highly wear-resistant gages have attained leadership . . . through superiority *proved* in the service of industry.

Gages of Stellite Cast Alloy by Woodworth have a service life many times that of steel . . . gage life is increased up to 25 times. They are non-corrodible and non-magnetic, have a low co-efficient of friction, low affinity for other materials and a co-efficient of expansion close to steel.

Gages of Stellite Cast Alloy by Woodworth will remain accurate much longer than those made from any of 18 other materials tested.

Write for descriptive Folder No. 44-S.

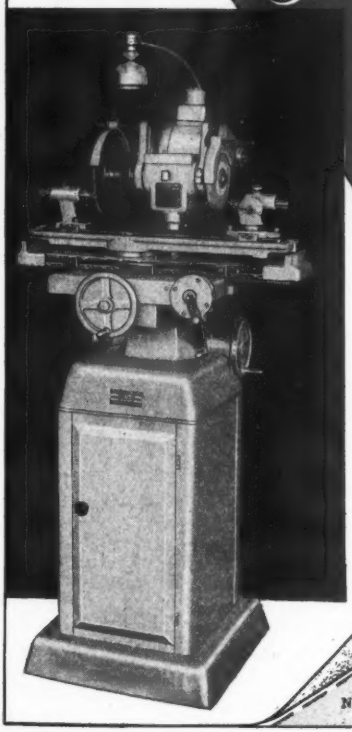
ACCURACY YOU CAN TRUST

WOODWORTH

N. A. WOODWORTH CO., SALES DIVISION, 1300 E. NINE MILE ROAD • DETROIT 20, MICHIGAN

PRECISION GAGES • PRECISION MACHINED PARTS

Model B660
Knock-Out
UNIVERSAL TOOL GRINDER
NINE OPERATING SPEEDS
1,100 to 11,000 R.P.M.



You'll Want This New Tool Grinding Book!

Illustrative literature just off the press is now available for the asking. Fifty-two operating pictures, latest improvements in tool grinders. Many time saving grinding fixtures that are adaptable to any make tool grinder.

Detach, fill out and send in coupon today.

K. O. LEE CO.,
Aberdeen, S. D.

Gentlemen:
Please send me by return mail, and without obligation, your new booklet No. 36-124

Name_____

St._____

City_____ State_____

Name of Company_____

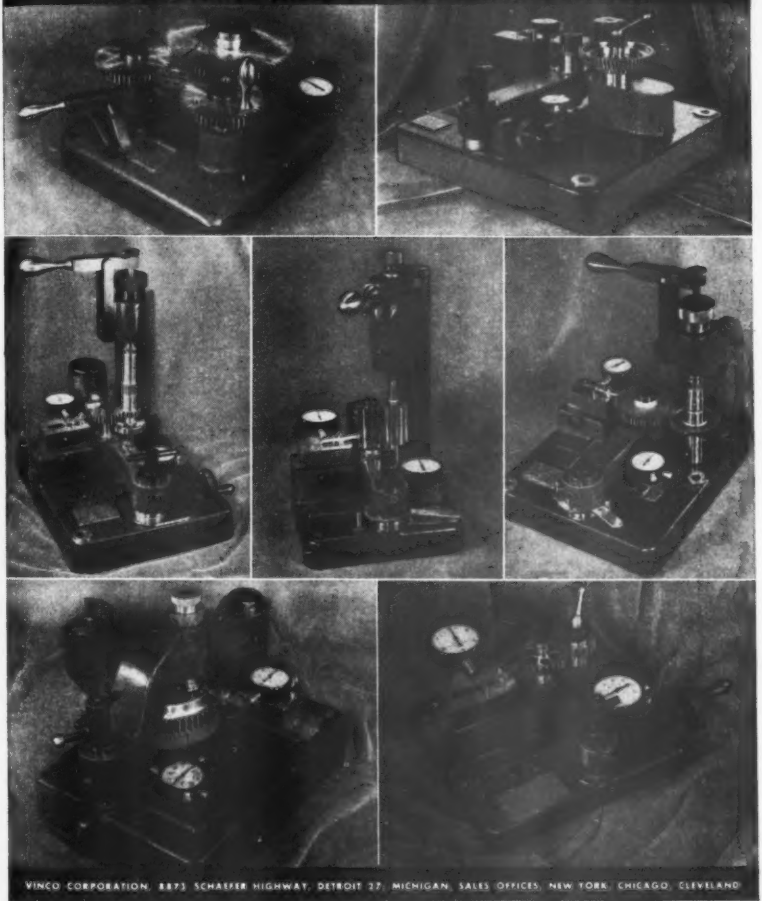
Severance new tool craftsmen regrind worn tools with the same precision and skill they use in manufacturing new tools. They give each flute the pitch and depth required to eliminate chatter. They carefully grind each tooth so your renewed tools take deep sharp bites like a new Severance Cutter. Each tool is given the Severite heat treat process that increases tooth hardness and lengthens cutting life 3 to 5 times. It will pay you to send your dull cutters (hand ground, mill or chisel cut) to Severance for a factory regrind job.

Severance

MIDGET MILLING CUTTERS • PRECISION REGRINDING • Severance Tool Industries Inc., Saginaw, Mich. • Plants in Long Island City 1, N. Y.; Detroit 2, Mich.; Fort Wayne, Ind.; Chicago 6; and Los Angeles 21, California. In Canada: 60 Front Street West, Toronto, Ontario.

VINCO GEAR ROLLING FIXTURES *with* MASTER GEARS

. . . a positive check for backlash and run-out.



VINCO CORPORATION, 8873 SCHAEFER HIGHWAY, DETROIT 27, MICHIGAN, SALES OFFICES, NEW YORK, CHICAGO, CLEVELAND

MILLIONTHS OF AN INCH FOR SALE BY V I N C O

Semi-Automatic Hydraulic Spline and Gear Grinder • Optical Master Inspection Dividing Head • Involute Checker • Angle Tangent to Radius Dresser • Index Plates • Precision Vises • Sine Bars • Straight-side Spline, Serration Spline, Involute Spline and Helical Spline Plug and Ring Gages • Thread Plugs, Rings and Setting Plug Gages • Spur and Helical Master Gears • Munition Gages • Propeller Hub Gages • Built-up and Special Gages • Gear Rolling Fixtures • Spline and Index Fixtures • Hydraulic Power, Control, Utilization and Distribution Units • Engineering, Design and Development

WHAT HAS THIS TO DO WITH BROACHING?

TODAY, countless ships plow fog-shrouded seas, hurrying vital supplies to our fighting men. Swarms of 'planes hum a dirge over the axis homeland. Arid lands are made fertile and productive. Mighty rivers are harnessed to provide power for distant war industries. Propellers — pumps —turbines . . . modern necessities and conveniences without number . . . stem from the unknown genius in whose brain was conceived the principle of the screw. The mists of years obscure his name, yet from Galileo to Gutenberg to Millennium, developments of this basic idea have, and will continue to, profoundly influence our civilization.

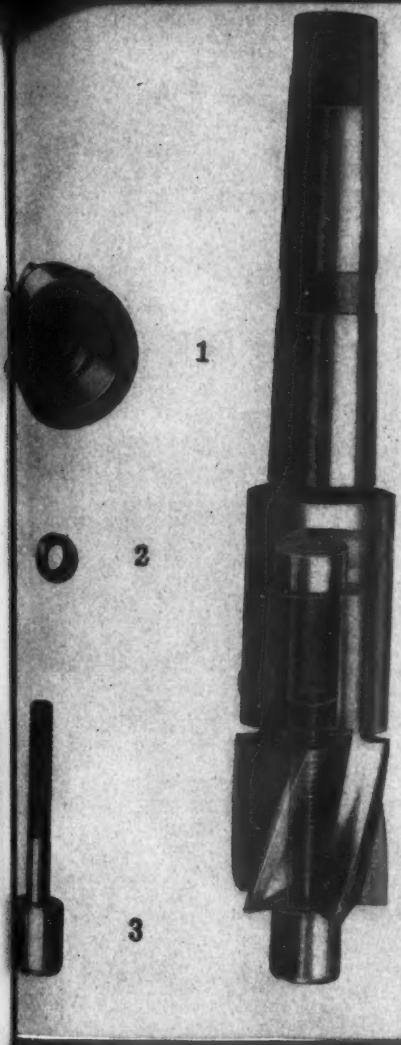
IN the same manner that so many complex machines, essential to Man's progress, developed from the fundamental principle of the screw, so too, has broaching developed from crude tools capable of limited uses, to mighty machines capable of performing metal removing operations with speed and precision, in an almost endless variety of shapes and sizes . . . and making them quicker, cheaper and BETTER!

The first broaching machines were invariably arbor presses, and were generally used to cut keyways in pulleys and gears.

The LAPOINTE Machine Tool Company

HUDSON, MASSACHUSETTS, U. S. A.

MANUFACTURERS OF BROACHES AND BROACHING MACHINES

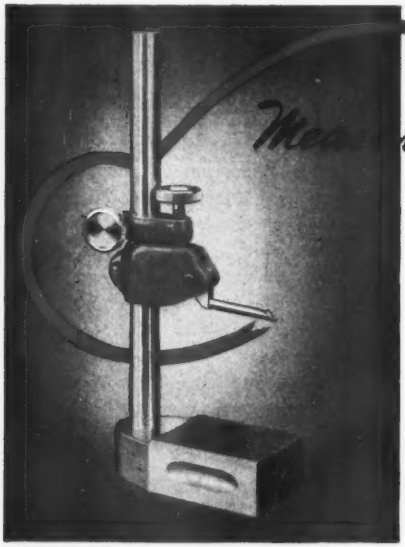


Introducing the eccentric principle in its design to completely equalize the torque load on the holder and the mating driving member of the cutter . . . the Moreland Counterbore Drive is shear proof. The driving member of the cutter fits into a cylindrical off-center hole in the holder . . . both shank of cutter and corresponding hole in holder being round in shape and eccentric in location only. Without any sharp edges, pins or wedges, this method of coupling cutter (4) and holder (1) eliminates any tendency to shearing action — it is practically as strong as a piece of solid bar stock of the same diameter and analysis. Proportionately longer cutter life can also be expected. The pilot (3) has no function other than as a guide — cutter can be drifted from the holder without disturbing its location. The pilot hole is ground to close limits and extends back, the same size, the full length of the flutes where it is enlarged to provide for inserting a brass nut (2) to hold the pilot in place. A brass nut is strong enough for the normal purpose of the pilot, but at all times when the guide hole is undersized and the pilot binds, the threads of brass tend to strip and prevent cutter damage.

A request on your letterhead will bring a twenty-page catalog which describes sizes of holders . . . standard and special cutters available.

MORELAND TOOL COMPANY

[illegible] W. McNICHOLS ROAD DETROIT 35, MICHIGAN



Measure Heights with Accuracy

The Dickerman Height Gauge has a wide range of usage as a height gauge, comparator or scriber. It is ruggedly constructed, accurately machined and perfectly fitted for precision measurement.

This gauge can be used for fine settings due to the differential screw adjustment. Measurement in the tenths of thousandths is quickly and accurately attained.

Above: Comparator use with standard dial indicator.

Above: Scriber use.

Below: Height gauge use.

D DICKERMAN

Made in three column lengths — 10″ — 14″ — 18″

Send for illustrated data folder.

H. E. DICKERMAN MFG. CO.

MANUFACTURERS OF DICKERMAN DIE FEED AND DICKERMAN HITCH FEED

[illegible] ALBANY ST. [illegible] SPRINGFIELD, MASS.

Designed and Engineered for

Rapid, Positive Clamping, Maximum Open Clearance

DANLY
Kwik-Klamp
TOGGLE CLAMPS

To Speed Assembly, Machining Operations, Metal and Plastic Stamping.

For complete data, including tested pressure figures, send for the new Kwik Klamp Catalog.

DANLY MACHINE SPECIALTIES, INC.

2100 South 52nd Avenue Chicago 50, Illinois

REXALLOY

STANDARD TOOL BITS • STANDARD TIPPED TOOLS • SPECIAL TOOLS-TIPPED AND SOLID • CASTINGS

REXALLOY TIPPED TOOLS
LONG AND SHORT TIPS

REXALLOY Standard Tipped Tools for "Middle-Range" Machining Applications Cost Less, Cut More and Reduce "Down Time"

REXALLOY Standard Tipped Tools are highly economical and efficient for "Middle-Range" machining applications. Tipped with REXALLOY, the tough cast cutting alloy, these tools handle work in that important range between the upper limits of high speed steel and the lower limits of tungsten carbide. They cost less, of course, than solid cast cutting tool bits and are better able to stand excessive shock and unusual tool angles. The high red-hardness of the REXALLOY tips permits vastly more speed, feed or depth of cut, better quality of finished product, and much less "down time" because of longer cutting life between grinds.

Your nearest Crucible Branch will gladly arrange for a REXALLOY Service Engineer to demonstrate REXALLOY Standard Tipped Tools, which are available from stock, competitively in precision panel. You stand to gain much by such a demonstration, so mail coupon today.

Crucible Steel Co. of America
405 Lexington Ave., N. Y. 17, N. Y.

☐ Please mail me your new 28-page book, *"REXALLOY CUTTING TOOLS"*.

☐ We would like to discuss the possible use of REXALLOY in our plant.

Name _____

Firm _____

Address _____

City _____

Buy More War Bonds

CRUCIBLE STEEL COMPANY "FULL-RANGE" QUALITY STEELS for INDUSTRY **of America**

Chrysler Building, 405 Lexington Ave., New York 17, N. Y.
Branches, Warehouses and Distributors in Principal Cities

NOT ONE—BUT TWO

major developments in gage block manufacture

What do these improvements mean to you?

These FONDA *"Ultra-Finish"* gage blocks are processed to such extreme surface smoothness and accuracy that they require no oil or other film for wringing. No peaks to wear off and reduce block size . . . no films between stacked blocks to introduce other errors. Faster wringing! Longer wear! And safer, surer protection for your production accuracy standards.

It means that you can obtain—at no premium on price—the same fine-precision FONDA gage blocks such as are used constantly by the National Bureau of Standards and leading laboratories, for *sustained high accuracy* in critical measurements.

PASSED HIGHEST TESTS DEVISED BY THE NATIONAL BUREAU OF STANDARDS

For a helpful summary of new modern developments in gage block manufacture, write for BULLETIN C

Prompt Deliveries

FONDA GAGE COMPANY
STAMFORD, CONNECTICUT

Agents in All Principal Cities throughout the World

44

FONDA *Gage Blocks*

ALSO FONDA PRECISION GAGES: Dial, Plug, Ring, Snap, Profile, Flush Pin, etcetera . . . all types except Thread gages.

Lower DEEP DRILLING *Costs* WITH OIL-HOLE DRILLS !

Our Oil Hole Drills have a patented oil passage which allows a larger flow of coolant to the cutting edge.

All our Oil Hole Drills from 3/8" to 3 1/2" diameter are furnished with **two oil holes.**

Subland Dual Diameter Oil Hole Drills permit **two** drilling steps in a single operation.

These **Subland Oil Hole Drills** feature our exclusive type *oil hole.*

If your needs require this type drill, our engineers are at your service.

Oil Hole Drill

REMEMBER—

the answer to successful drilling is

Oil at the Cutting Edge

All sizes from 3/8" to 3 1/2" in diameter and up to 36" overall

Please specify taper or straight shank

DETROIT REAMER & TOOL CO.

2830 E. 7-Mile Road, Detroit 12, Mich.

Manufacturers of

Oil Hole Drills Special Reamers
Circularity Relieved Reamers
and End Mills
Also Special Tools

Subland or Dual Diameter Oil Hole Drill

● Geared to the precision demands of war, Chicago Wheels have been a potent force in speeding production to an all-time high. Chicago Wheels produce finishes so perfect they pass exacting surface analyzer tests, so accurate they can be measured in micro inches. Production of civilian goods will demand the same precision finishing methods. Keep pace with Chicagos, the Wheels of Progress!

CHICAGO GRINDING WHEELS—Anything up to 3″ in diameter in various grains and bonds, including FV, the sensational new bond with a pedigree.

CHICAGO MOUNTED WHEELS—Shapes and abrasive formulas to take care of every job of internal or external finishing.

CHICAGO WHEEL & MFG. COMPANY
Headquarters for Mounted Wheels and Small Grinding Wheels
1101 W. Monroe St.
Dept. TD
Chicago 7, Illinois

Half a Century of Specialization has Established our Reputation as the Small Wheel People of the Abrasive Industry

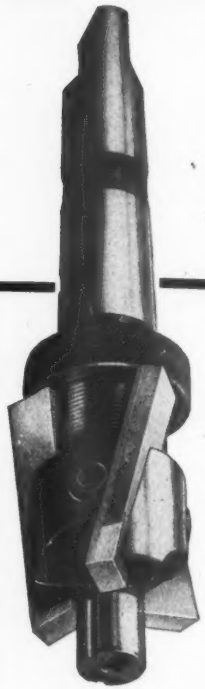
TRY ONE FREE! So you'll know what they can do, we will send a test wheel. Tell us material you'd like to finish and size wheel required.

TD-12

Send Catalog. Interested in ☐ Grinding Wheels. ☐ Mounted Wheels. ☐ Send Test Wheel. Size_____

Name_____

Address_____



This is the only standard inserted blade type **FACING AND COUNTERBORING TOOL**

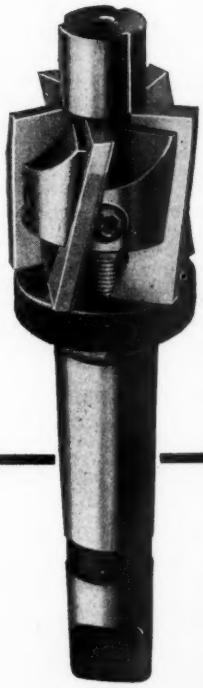
GENESEE

Replaceable Blades — Interchangeable Pilots — Constant Chip Space

STANDARD SIZES FROM 1¼ TO 4 IN. IN DIAMETER

STYLE H tools are designed for heavy cuts where maximum stock removal is required.

STYLE F tools are recommended for light finishing cuts where a very smooth and accurate finish is required.



Genesee Tools have blades set on a back slope to permit adjustment for size and regrinding diameter and front edge.

WRITE FOR COMPLETE CATALOG 44-T

ESTABLISHED IN 1908

GENESEE MANUFACTURING CO., INC.

ROCHESTER 4, N. Y., U. S. A.

Adjustable Hollow Mills and Special Production Tools

FOR ACCURACY TO .0001"...

SpeediChuk

WITH THE Precision **BREN COLLET**

Increases 1/2" Collet Capacity Lathes to 3/4"

- **Fits ATLAS, LOGAN, SOUTH BEND, CLAUSING Lathes and others with a 1½" x 8 Thread Spindle Nose having a No. 3 Morse Taper on inside**

Accuracy to .0001" is possible with SPEEDICHUK because of its unique floating closing ring and the BREN Collet, whose body taper conforms with the taper of the lathe spindle.

Centering to desired accuracy may be attained by tapping work, and indicating. SPEEDICHUK is ideal for tool room use or short production runs where speed in opening and closing on work is not essential. It requires no adapter plate and is easily fitted to the lathe.

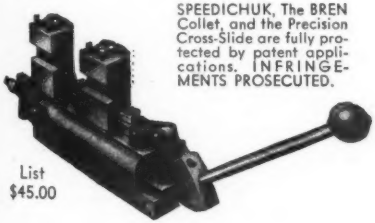
List Price
SPEEDICHUK
$19.75
BREN Collets
Round $4.50
Sq. & Hex. $7.50

IMMEDIATE DELIVERY FROM STOCK

..AND FOR PRODUCTION CUT-OFF WORK, FORMING, ETC.

THE NEW Precision LEVER TYPE **CROSS-SLIDE**

- **Equipped with sensational tool leveling adjustment — Maintains tool in absolutely horizontal position.**



SPEEDICHUK, The BREN Collet, and the Precision Cross-Slide are fully protected by patent applications. INFRINGEMENTS PROSECUTED.

List
$45.00

A sturdily constructed job, this Cross-Slide has no rack and pinion to become clogged with chips. Handle adjustable in three positions for convenience of operator. Has a five inch travel.

Three models fitting Atlas, Logan, 9" South Bend; can be adapted to most other bench lathes.

- Order from your dealer or write us for literature.

GENERAL DIE-STAMPING-TOOL COMPANY
Precision Collet Division, 262-272 Mott St., New York 12, N. Y.

Precision product

Setting Performance Records for Precision Machining

South Bend Precision Turret Lathe in the Factory of the Republic Aviation Corporation

High precision and close tolerances have always been the watchwords of the aviation industry. But with the war came demands for higher speeds and better performance. This meant that even closer tolerances had to be established and maintained. We are proud that providing lathes to meet the exacting needs of warplane production is one of our important assignments. Throughout the aviation industry South Bend Lathes are setting enviable performance records for precision machining.

In all metal working industries, South Bend Lathes are giving the same dependable service that they are giving in the aviation industry. Versatile and efficient, they are also used for emergency service work by the Armed Services.

Now, as before Pearl Harbor, our entire factory is devoted only to the production of South Bend Lathes. There has been no lowering of standards because of wartime restrictions and shortages. Improvements have been accelerated. Today, South Bend Lathes are better in every way.

South Bend Engine Lathes and Toolroom Lathes are made in five sizes: 9″, 10″, 13″, 14½″, and 16″ swing. Precision Turret Lathes are available in two sizes: Series 900 with ½″ collet capacity, and Series 1000 with 1″ collet capacity. Write for Catalog No. 100-C.

POST-WAR PRIORITY PLAN

To those who cannot qualify for a wartime priority, South Bend Lathe Works offers a practical Post-War Priority Plan. You can place your order now for any South Bend Lathe. No deposit or down payment is required. We ask only that the order be placed in good faith. When civilian production is resumed, orders will be filled in the sequence established by the numbers of the Post-War Priority Certificates. Should conditions necessitate, the order may be cancelled at any time. Write for details of this plan.

BUY WAR BONDS NOW • • • SAVE FOR LATHES

SOUTH BEND LATHE WORKS

LATHE BUILDERS FOR 38 YEARS • SOUTH BEND 22, INDIANA

At Right: Small shutter parts being honed on Sunnen "MA" Precision Honing Machine.

Below: Navy photographer using Fairchild F56 Aerial Camera with 8¼" focal length for oblique photography.

Precision-Built FAIRCHILD Aerial Cameras

ACCURACY IN ACTION!

—made possible by

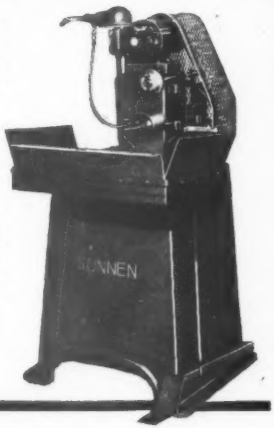
SUNNEN HONING

For high precision work on small vital parts, Fairchild *uses Sunnen honing.* After grinding, these parts are honed to extreme accuracy — often within .0001": The inside surfaces of these diameters must be polished to a super-smooth finish to reduce friction on bearing surfaces — for these parts must operate faultlessly at temperatures from —70° F. to 165° F.!

Remember — the Sunnen Model "MA" Precision Honing Machine handles any diameter from .185" to 2.625" with a *guaranteed* accuracy of .0001" and a finish of 2 to 3 micro inches.

Write for new bulletin giving complete information!

The coveted Army-Navy "E" waves over the Sunnen plant —evidence of the important part Sunnen equipment is playing in the war effort.



SUNNEN PRODUCTS COMPANY

7947 Manchester Ave., St. Louis 17, Mo.

Canadian Factory: Chatham, Ontario

SUNNEN

Typical Jobs

Aircraft Hydraulic Brake Cylinder. Honing 3 times faster than lapping — and gave a straighter hole.

Aircraft Valve Tappet Roller. Honed after grinding to give 100% bearing surface.

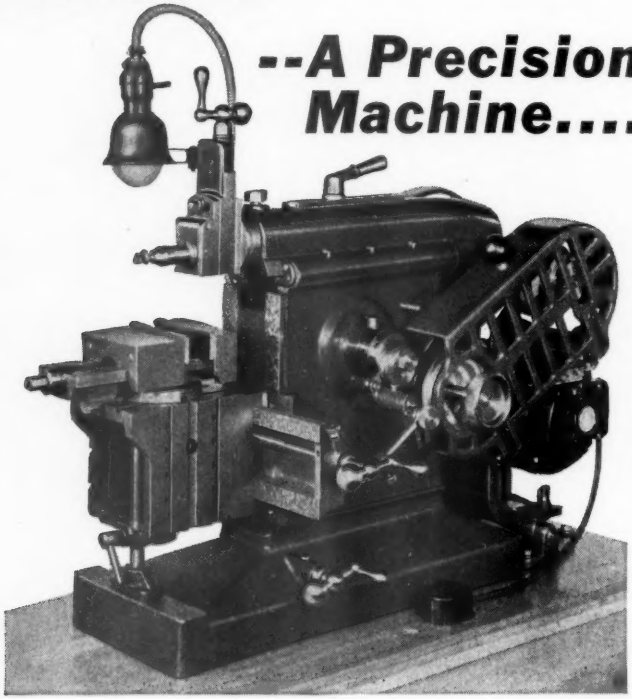
Aircraft Carbureter Operating Valve Sleeve. Sunnen honing eliminates distortion from assembling operation.

Hydraulic Control Bushing. Honing gives straight round hole after rough reaming.

Aircraft Piston Pin. Sunnen honing is twice as fast and gives a cleaner, better looking pin.

AMMCO 7″ SHAPER

--A Precision Machine....



On jobs requiring a stroke of 7″ or less, the AMMCO 7″ SHAPER will enable you to save a lot of time and expense on a set-up such as would be required on larger shapers . . . You also have an opportunity to effect considerable savings in capital investment . . . savings in electrical power consumption . . . and savings in floor space . . . Furthermore, in addition to getting away from the larger cost of operating a big shaper on small work, the AMMCO will leave big shapers open for big jobs . . . Users tell us "it's the finest made."

Available for stationary installation, or as a portable unit.

ARMY E NAVY

Write today for specifications and prices.

AMMCO 2100 COMMONWEALTH AVENUE
NORTH CHICAGO, ILLINOIS

HS-7

HASKINS FLEXIBLE SHAFT UNITS ARE BUILT FOR SERVICE

They'll stand continuous hour after hour use—three shifts a day—seven days a week. They'll turn out more work—better work—faster and easier, with longer trouble-free operation. Use your Haskins Flexible Shaft Machines—use them hard. They won't let you down. Learn new ways of increasing production with flexible shaft equipment from Catalog 45. Write to R. G. Haskins Company, 625 So. California Ave., Chicago, Illinois.

HASKINS
Flexible Shaft
EQUIPMENT
More VERSATILE Machines for
More PROFITABLE Work

HERE'S THE COLLET FOR HOT-ROLLED STOCK

•In Sutton Full-Floating Style "F" Collets, each jaw floats independently, comes to a full bearing on the stock and allows the collet to run as true as the machine spindle.

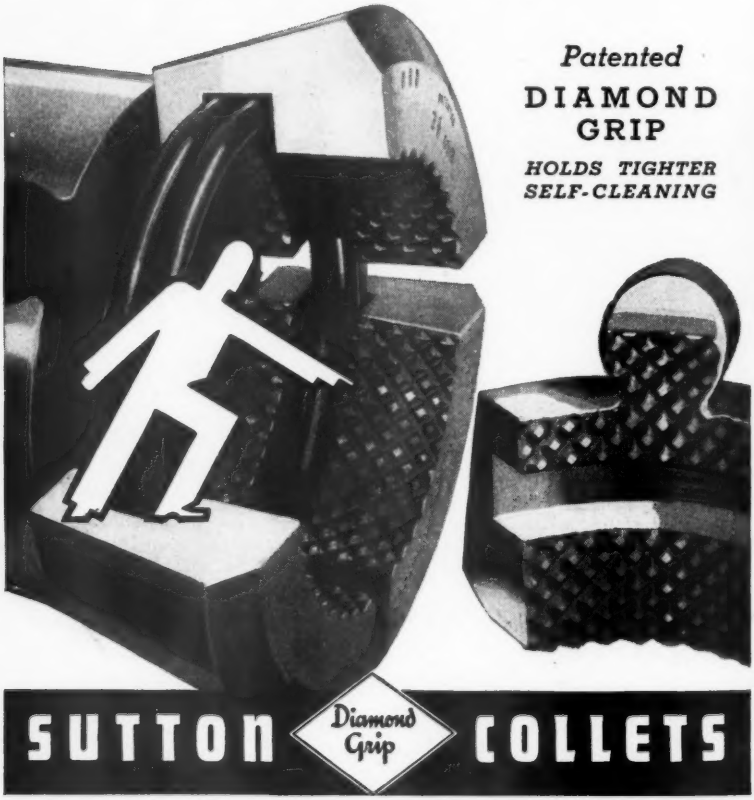
Patented Diamond Grip extends on to the tongue of the jaw, grips tightly with about two-thirds tension necessary with ordinary, single-piece collets, prevents slippage, reduces scrap, reduces strain on machine parts and tools.

Style "F" Collets are equally effective on cold-rolled stock and one set of the replaceable Style "F" jaws often outwears three standard collets.

Sutton Diamond Grip Collets cost no more than ordinary collets.

SUTTON TOOL CO. ***Sturgis, Michigan***

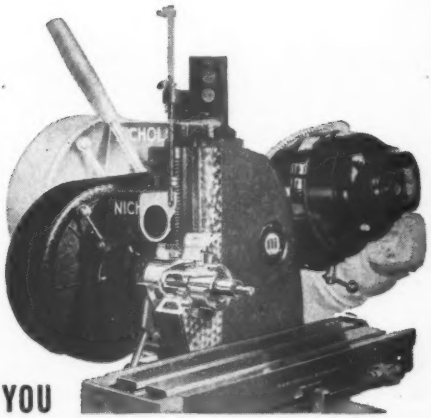
See our representative or send for Catalog No. 15.



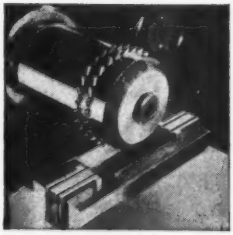
THE

BUSY

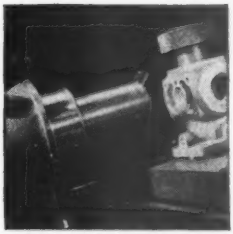
MILLER



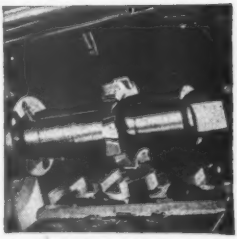
HOW IT CAN WORK FOR YOU



Milling Two Intersecting Slots, two up, to a perfect intersection.



High-Speed Fly-Cutting of aluminum or magnesium.



Heavy Hand Milling, with staggered-tooth cutter and heavy vise.

The Nichols Miller has a knack for keeping busy around the shop. It takes on dozens of high-speed machining jobs, even those normally delegated to heavier, costlier millers. And it's not unusual to see it doing the work of precision boring machines, lathes and grinders more economically...*to tolerances in "tenths."*

Visualize this multi-purpose flexibility at work on your production line or in the toolroom. Then consider these *plus* factors: rise-and-fall spindle which brings the cutter to the work...compactness and ease of set-up...lower-cost-per-piece-milled.

Investigate the Nichols Miller for your reconversion needs.

FREE BROCHURE demonstrates utility of Nichols Millers. Write for your copy today.

THE NICHOLS MILLER

"THE MILLER THAT USES ITS HEAD" • MFD. BY W. H. NICHOLS & SONS, WALTHAM, MASS.

NAT'L DISTRIBUTORS: NICHOLS-MORRIS CORP. • 44 CHURCH ST., NEW YORK 7 • *Dealers in all principal cities*

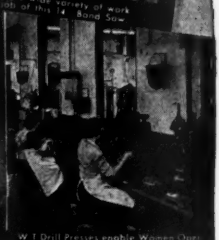
THE SOLUTION

TO MANY RECONVERSION PROBLEMS LIES IN THIS INTERESTING CONVERSION STORY

Handling a wide variety of work is the job of this 14" Band Saw.

This W-T Drill Press can drill at any point in a circular workpiece.

Five operations are speeded up on this six-spindle Drill Press.



W-T Drill Presses enable Women Operators to meet high production schedules.

The W-T Radial Drill is fast, easy to operate, simple to set.

WALKER-TURNER MACHINE TOOLS played an important part in the quick conversion of Horni Signal Manufacturing Corporation from the manufacture of fire alarm and traffic controls to electronic signaling, locating and rectifying equipment. Speedy delivery of Walker-Turner Machine Tools got production rolling months sooner. Their *easy, simple operation* helped the new workers. Their *wide range of operating speeds and flexibility* made them ideal for practically all materials. Photographs show applications in the Horni plant.

These Walker-Turner features, plus *low price and low operating costs*, will enable you to make a quick and successful reconversion.

WALKER-TURNER COMPANY, INC., PLAINFIELD, N. J.

walker-Turner COMPANY, INC. PLAINFIELD, N.J. U.S.A.

MACHINE TOOLS

DRILL PRESSES — HAND AND POWER FEED • RADIAL DRILLS
METAL CUTTING BAND SAWS • POLISHING LATHES • FLEXIBLE SHAFT MACHINES
RADIAL CUT-OFF MACHINES FOR METAL • MOTORS • BELT & DISC SURFACERS

KNOCK DOWN SETTING-UP TIME

50% to 75%!

SIEWEK

Fixture Clamps and Fittings

• JACK LOCKS • FIXTURE LOCKS

• REST BUTTONS • RESTS & CAMS • HAND KNOBS

Also Makers of
SIEWEK
Rapid Clamping Drill Jigs
and
Progressive
SHEAR-CUT **End Mills**

As a result of skilled engineering, Siewek Clamps save 50% to 75% of the time ordinarily required to meet the job conditions. These clamps also require a minimum of details to fit them to the job. *Moreover, you can buy the complete clamp assembly for less than the cost of designing it on your drawing board.*

Made in 24 different types, most of them in three sizes, there are Siewek Clamp Assemblies to meet the needs of most jobs in practically any shop. They are strongly constructed to provide uniform right angle pressure for secure holding. Clamp bars are specially heat treated and hardened to give maximum service. Siewek Clamps are made to last for years, with a liberal factor of safety.

Write today for full size template drawings to use in laying out work.

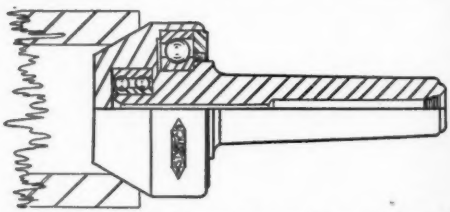
SIEWEK TOOL DIVISION

OF DOMESTIC INDUSTRIES, INC.

DETROIT (FERNDALE STATION) MICHIGAN • *Distributors in Principal Cities*

LIVE CENTER *adapted to Tube Turning*

The basic design of the STURDIMATIC Live Center is ideally adapted to tube turning . . . extra large sections are no problem with this set-up . . . in most of these cases (see mechanical drawing) there is a tool clearance . . . Characteristic of all STURDIMATIC design is this low overhang which together with a slight cushioning action, that compensates for expansion, due to heat, shock and excessive thrust loads—reduces wear to a minimum . . . we will see that your job gets setup with the right LIVE CENTER . . .



Standards with Morse Tapers (2 to 6) Carried in Stock.
Special LIVE CENTER for turning extra large tubing.

STURDIMATIC TOOL COMPANY
5218 THIRD AVENUE
DETROIT 2, MICHIGAN

DOUBLE-CUT MILLED TOOTH VIXEN FILES

for many years...

HAVE GIVEN QUICK PERFORMANCE ON BOTH HARD AND SOFT METALS AND OTHER MATERIALS

Of a distinctive milled cut tooth design, this 14" Heller VIXEN Flat Double-Cut Milled Tooth File, No. 859, is particularly recommended for such soft metals and materials as babbitt, brass, bronze, copper, aluminum, lead, plastics and fiber. It has been widely used FOR MANY YEARS on hard and soft rubber and in metal pattern work.

As its name indicates, it is a *double-cut milled* tooth file. The rows of teeth are spaced wider toward one side of the file than they are toward the other. The result is the characteristic tooth design illustrated that enables this special Heller VIXEN to cut both *rapidly* and *smoothly*.

No. 859 VIXEN works with a genuine shearing cut, inasmuch as no two successive teeth in any longitudinal row are in alignment. It produces a much smoother surface in cutting soft materials than is possible if the file teeth were to follow each other at regular intervals. Chattering is eliminated, and a more durable, long-lasting file is obtained.

HELLER BROTHERS COMPANY
America's Oldest File Manufacturers
Good Tools Since 1826
Newark 4, N. J. · Newcomerstown, Ohio

GENUINE HELLER VIXEN CURVED TOOTH FILES

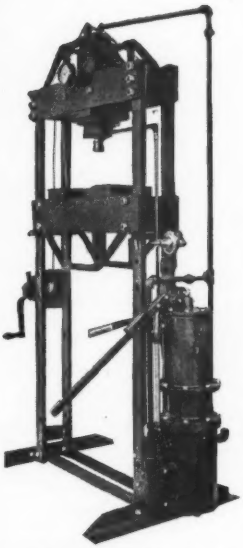
Friction Sawing with Tannewitz HIGH SPEED BAND SAWS

Write for Your Copy

Trimming formed parts . . . Cutting Sheet Steel, 1-inch Armor Plate, Plastics or what have you . . .

"The process is to some so spectacular that they refuse to believe their own eyes"—so writes the chief tool research engineer for one of the largest aircraft corporations. Previous cutting costs are radically reduced, difficult and slow cutting of certain materials made swift, easy and safe. By all means write for your copy of "FRICTION SAWING" by Arthur A. Schwartz, Chief Tool Research Engineer, Bell Aircraft Corporation which will soon be off the press. It's free.

THE TANNEWITZ WORKS GRAND RAPIDS 4, MICHIGAN



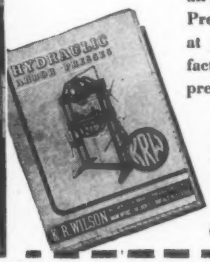
These KRW HYDRAULI PRESS FEATURES ARI *"Like Money in the Bank*

1 LOW INITIAL COST
2 LOW OPERATING COST
3 FAST, FLEXIBLE OPERATION
4 LOW DIE COSTS

EQUIPPED WITH PATENTED KRW SPEEDI-BOOSTER AND USING LOW-COST DIES, THEY DO THE WORK OF EXPENSIVE PRESSES AND BENDING MACHINES ON SHORT RUN PRODUCTION

● Some of the manufacturing uses to which KRW Hydraulic Presses are being put today, are almost unbelievable in their originality and efficiency. Nevertheless, the versatility and adaptability of these air-operated presses is being profitably proven today by many factory and production executives. Heart of the New KRW Speedi-Booster Hydraulic Press is its sensitive finger-tip control mechanism which instantly governs ram movement — lower, raise or stop. With a few simple and inexpensiv dies these KRW Presses can be adapted to a wid variety of bending and pressing operations requi ing pressures from 5 to 75 tons. Air pressure var ing from 80 to 225 pounds is required—resultin hydraulic pressure varies with air pressure use Built-in air regulator permits exact duplication o pressure at each stroke...important in many types o fast production. Available for either vertical or hori zontal operation. Quick delivery o all sizes. Write for KRW Hydrauli Press Bulletin. Our Engineers ar at your service. We also manu facture suitable capacity air com pressors.

Quantity production keeps KRW Hydraulic Press prices very low.



SEND FOR THIS 24-PAGE ILLUSTRATED HYDRAULIC PRESS CATALOG . . .

full of valuable data

K. R. WILSON
BUFFALO 2, NEW YORK

K. R. WILSON, 18 Lock St., Buffalo 2, N. Y.
Please mail me a copy of your Hydraulic Press Catalog.
Name.....
Address.....
City..... *State*.....

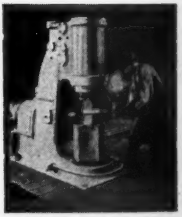
A Self-Contained Pneumatic Forging Hammer

The Chambersburg Pneumatic Forging Hammer has a greater forging output than any other hammer of its type. Added to the advantage of more powerful blows is that of greater rapidity of blows, which permits working the forging at higher temperatures.

The hammer is of the self-contained type, having a compressor piston cylinder and ram cylinder in which a compressor piston and a ram operate. In operation the ram is driven up and down by a flexible air force, created by the compressor piston. The compressor piston is driven by an electric motor of high speed through two stage speed reduction gearing.

The hammer can be started instantly and strikes a constant number of blows heavy or light at the will of the operator. As soon as the motor is up to speed the hammer is ready to operate.

A new bulletin is now available . . . Write for your copy



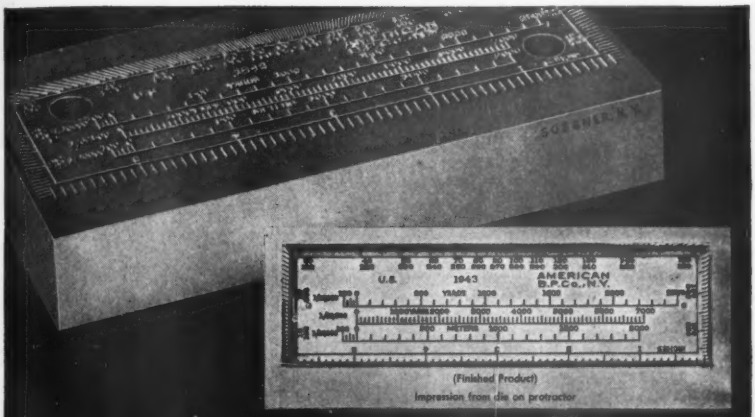
Made in 3 types:

1. One Piece (as above), 200 lbs. and 300 lbs.
2. Solid Frame, 300 lbs. and 500 lbs.
3. Two Piece Frame, 750 lbs. and upward.

CHAMBERSBURG ENGINEERING CO., CHAMBERSBURG, PA.

CHAMBERSBURG

HAMMERS · CECOSTAMPS · PRESSES



STEEL STAMPS AND DIES

for precision marking

For stamping calibrations and numerals in micrometers, protractors, rules, dials, and all graduated precision measuring tools. Accuracy maintained to .0001 inch. For use on all types of metal and processed materials. All dies are carefully hardened to insure maximum production.

ALSO:
TAPS
GAGES
CUTTING TOOLS

SOSSNER

161 Grand Street, New York 13, N. Y.

Universal Collet Chucks Precision-Built to Fit the job

In addition to the four chucks shown here Universal also manufactures Boring Chucks, Mikro-lok Boring Bars, Grippets, Plungers and a complete line of standard drill bushings. Write today for catalogs on all or any one of these precision made products.

Universal Centering Chucks make a centering machine of most any medium size drill press.

Universal Floating Chucks are designed especially for horizontal operation in screw machines and turret lathes.

Universal Standard Collet Chucks have a grip as strong as solid steel itself —are available with tang or plain tapered shank.

Universal Collet Chuck with National Milling Machine Taper Shank.

Fighter Plane
Given by employees

20% Employees
Bond deductions

20%

UNIVERSAL ENGINEERING CO.
FRANKENMUTH, MICHIGAN

Putting "Hep" IN THE "CATS"!

NEWSWEEK of August 28 reports of Lieut.-General George S. Patton, Jr., as follows: "If he had to choose between tanks and bulldozers for an invasion he would choose road-building equipment every time." More than a construction machine, the bulldozer has been a powerful factor in winning many battles.

To quickly, efficiently fit axle shafts and bearing cups into bulldozer transmission cases, *American* engineers designed a special horizontal assembly press. A conveyor line brings the cases to the machine and removes them after operations are completed. The part is stopped, locked in position, pressed, and released by this hydraulically operated, push button controlled machine.

This is another example of how the American Broach and Machine Company help leading manufacturers increase output of vital war materials. When the war job is done, *American's* complete service of machines, tools, and engineering will be available to speed manufacture of civilian goods. Let *American* engineers show you how broaching or special machinery can solve your production problems. Write today for details.

"Grind broaches at proper intervals to prevent loss of broach life."

BROACHING TOOL INSTITUTE

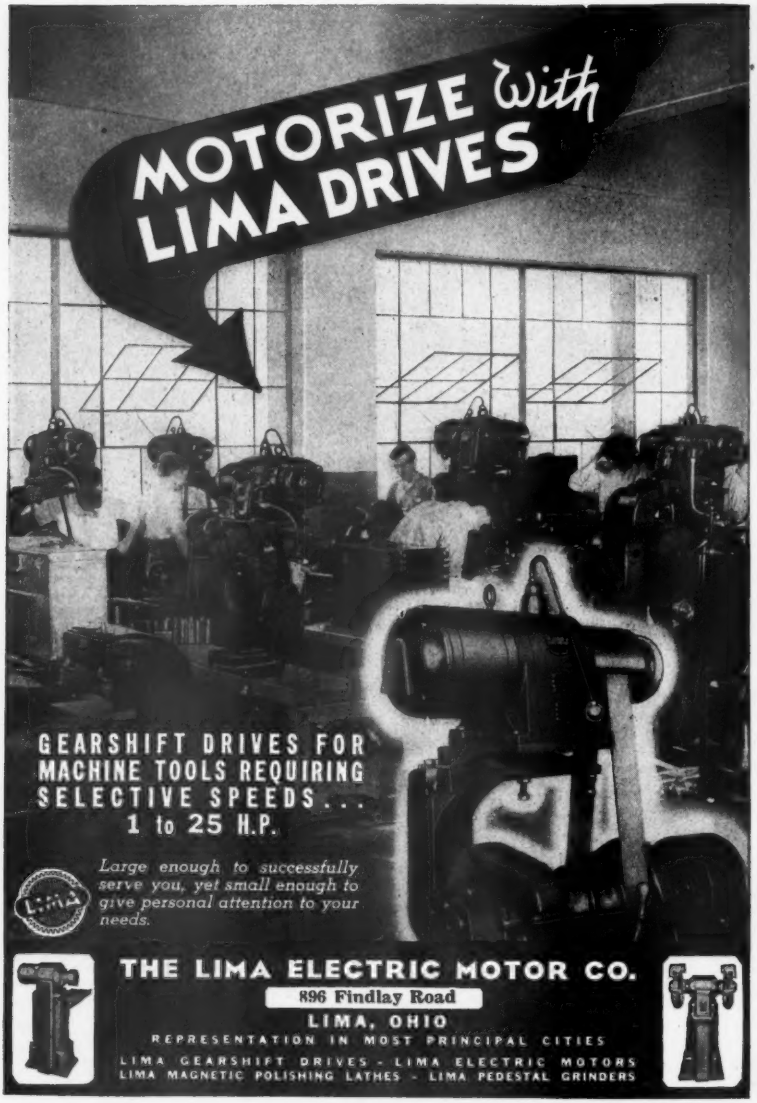
American

BROACH AND MACHINE CO.

ANN ARBOR, MICHIGAN

BROACHING MACHINES
PRESSES
BROACHING TOOLS
SPECIAL MACHINERY

DIVISION OF

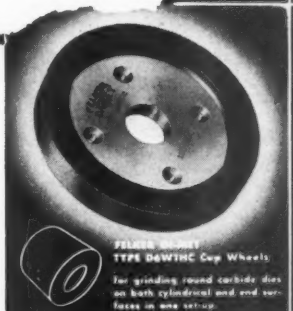

MOTORIZE With LIMA DRIVES
GEARSHIFT DRIVES FOR MACHINE TOOLS REQUIRING SELECTIVE SPEEDS . . . 1 to 25 H.P.
Large enough to successfully serve you, yet small enough to give personal attention to your needs.
THE LIMA ELECTRIC MOTOR CO.
896 Findlay Road
LIMA, OHIO
REPRESENTATION IN MOST PRINCIPAL CITIES
LIMA GEARSHIFT DRIVES - LIMA ELECTRIC MOTORS
LIMA MAGNETIC POLISHING LATHES - LIMA PEDESTAL GRINDERS

5 POPULAR FELKER DI-MET Diamond Wheels

For Everyday Carbide Grinding

FELKER DI-MET
TYPE D11WF Flaring Cup Wheels

for grinding milling cutters and other multiple-tipped tools



FELKER DI-MET
TYPE D6WTHC Cup Wheels

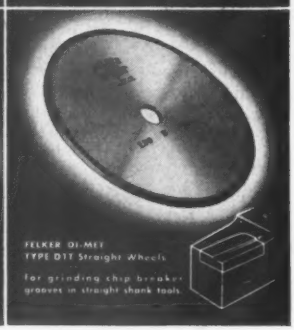
for grinding round carbide dies on both cylindrical and end surfaces in one set-up.

FELKER DI-MET
TYPE D1T Cut-off Wheels

for segmenting carbide bars into convenient sizes for tipping special tools

FELKER DI-MET
TYPE D6WHC Straight Cup Wheels

for grinding straight shank tools



FELKER DI-MET
TYPE D1T Straight Wheels

for grinding chip breaker grooves in straight shank tools.

FELKER DI-MET

ARMY-E-NAVY

Felker DI-MET diamond wheels are fast and free cutting, with long, economical life. Made in both metal and resinoid bonds in all popular types and sizes. Write for our free catalog giving specifications, prices, discounts and operating information. No obligation.

FELKER MANUFACTURING COMPANY 1111 Border Ave., Torrance, Calif.

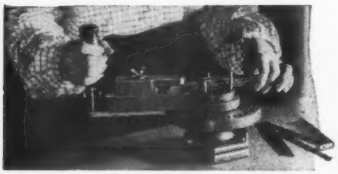
MANUFACTURERS OF FELKER DI-MET DIAMOND ABRASIVE WHEELS

Talk About PRODUCTION Without DIES!

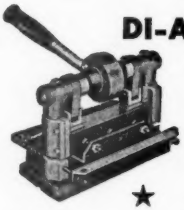
4,000 PARTS per DAY with DI-ACRO Bender

"Enclosed pictures in our plant prove the DI-ACRO Bender will do a real production job. We are making 4,000 completed parts per day which is competitive to most Power Presses." (Name on Request.)

Here is an example of "DIE-LESS DUPLICATING" typical of a great variety of formed parts readily made with DI-ACRO Precision Machines, — Benders, Brakes, Shears. Picture below shows the DI-ACRO Bender making an acute right angle bend and photograph above shows the finished part formed to die precision. Women operating DI-ACRO units maintain a high out-put on production work.



DI-ACRO Shear



Squares and sizes material, cuts strips, makes slits or notches, trims duplicated stampings. 3 sizes. Shearing widths, 6", 9", 12".

★

DI-ACRO Brake

Forms non-stock angles, channels or "Vees". Right or left hand operation. 3 sizes. Folding widths, 6", 12", 18".

Send for Catalog

showing DI-ACRO Precision Machines and many examples of parts made with "DIE-LESS DUPLICATING".

Pronounced "DIE-ACK-RO" ⟹

O'NEIL-IRWIN MFG. CO.

315 EIGHTH AVE. SOUTH • MINNEAPOLIS 15, MINNESOTA

CHECK your DRILL JIG BUSHINGS against these XLO STANDARDS

EX-CELL-O for PRECISION

- ✓ Held to close limits
- ✓ Absolutely uniform
- ✓ Easy to replace
- ✓ Long useful life

FOR CONVENIENT DELIVERY

of Ex-Cell-O Drill Jig Bushings stocks are carried at Ex-Cell-O's New York office and in Los Angeles by the Machinery Sales Company in addition to the main Ex-Cell-O plant and office in Detroit.

Ex-Cell-O Drill Jig Bushings are precision-made by experienced craftsmen in a wide variety of sizes and styles. To save time and trouble in ordering, write for your free copy of Ex-Cell-O Bulletin No. 11882-A.

EX-CELL-O CORPORATION

DETROIT 6 MICHIGAN

NEED
STANDARD DIE SETS
OR
DIE MAKERS' SUPPLIES?
Call "DETROIT"

The wartime growth of our business is due not only to the general increase in metal-working activity but also to our genuine desire to serve the best interests of every customer, and help solve their production problems. We invite your inquiries regarding standard and special die sets, all steel and semi-steel, dowel pins, cap screws, die springs and other accessories.

DETROIT DIE SET CORPORATION

2895 W. GRAND BLVD. DETROIT 2, MICH.

CALL "DETROIT"

DETROIT	TR 2-5150
INDIANAPOLIS	LI 3884
MINNEAPOLIS	AT 5264
DAYTON	HE 3042
TOLEDO	GA 5706
SEATTLE	SE 2090
PORTLAND, Ore.	AT 1466
SAN FRANCISCO	MA 8532
PHILADELPHIA	VIC 4084
BUFFALO	PA 9206

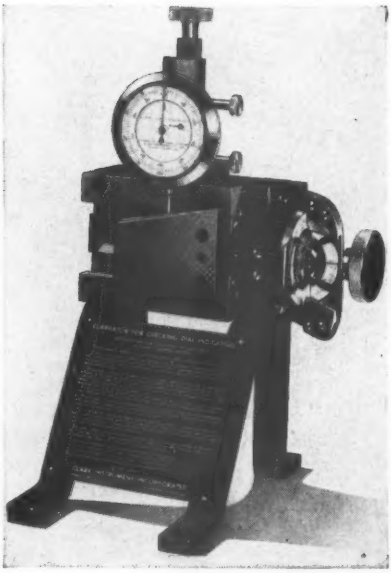
DETROIT DIE SETS ★

Clarkator

CHECKS DIAL INDICATORS

Micrometer speed with sine bar precision — the fastest, most accurate method ever developed for checking dial indicators! Clarkator gives 100% inspection on every vital point. Checks comparators, hardness testers and all other instruments requiring precision dial indicating.

The Clarkator is sturdily built for long trouble-free service. Easy to operate — just four simple steps! Complete operating instructions are permanently attached to base.



Be sure of absolute accuracy of indicator readings. Put Clarkator to work for you. Regular use will provide a saving in test results alone worth many times its low cost! Illustrated 2-color circular contains complete descriptions and specifications of the Clarkator. Write for your free copy today! Dept. TD.

CLARK

TOMORROW'S ACCURACY TODAY

HARDNESS TESTER

Clark Instrument, Inc., 10200 Ford Road, Dearborn, Mich.

When you change over to civilian products—here's how EUREKA Tool and Die Welding Electrodes will help you save time, material and avoid production delays.

1. **You can repair existing die units to keep them in operation with a minimum of "down-time".**
2. **Changes can be made during die "try-out" periods by correcting design, rectifying errors, etc.**
3. **During die "change-over" contours, corners and edges of your old dies can be welded to adapt them to change in design.**
4. **Die units can be compositely fabricated by welding with desired tool steel electrodes, on mild or medium carbon steel, to form cutting edges or working areas.**

Space does not permit detailed information here—so write us today for descriptive literature.

Distributors in principal cities of U. S. A. and Canada

EUREKA ELECTRODES — TOOL FIND THE WAY

Welding Equipment & Supply Co.

PIONEERS IN TOOL AND DIE WELDING ELECTRODES

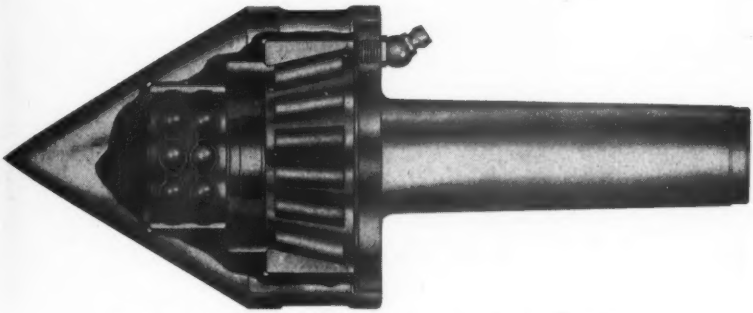
223 LEIB STREET • FITZROY 3715 • DETROIT 7, MICHIGAN

MARVECO

PRECISION

When we speak of MARVECO PRECISION we speak of PRECISION built into the tool. Not just for a few minutes performance but actually MONTHS OF PRECISION operation.

Have you tried your Marveco yet?



The MARVECO is GUARANTEED to OUTPERFORM and OUTLAST any other LIVE CENTER.

. . . Let us prove it! . . .

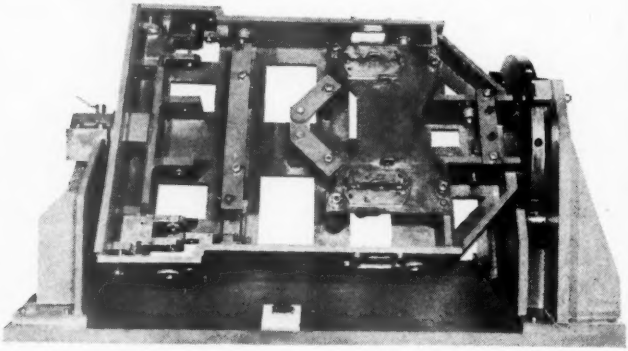
SEND US YOUR CENTER PROBLEMS

MARVEL TOOL & MACHINE COMPANY

Exclusive Manufacturers of MARVECO...The Live Center

10973 W. JEFFERSON, RIVER ROUGE 18, MICHIGAN

POTTS
MACHINE COMPANY



EXTRA LARGE TRUNNION FIXTURE

Our Facilities for the manufacture of Jigs and Fixtures are of the greatest range and highest precision. Above photo of a large 4 position Indexing Drilling, Boring and Reaming Fixture with its small drill Jig, illustrates the Range of our work.

We solicit your inquiries

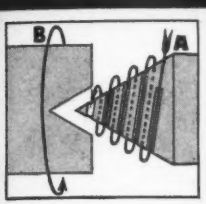
POTTS MACHINE CO., 2501 E. Michigan Ave., JACKSON, MICHIGAN

Builders of Tools, Dies, Jigs and Fixtures

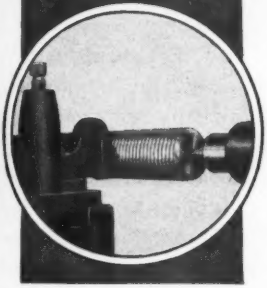
The work stays cooler with...

CMD

Helical Groove CENTERS



Arrow A shows flow of lubricant around helical groove.

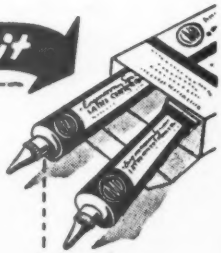


CMD CENTER POINT OIL

When CMD Helical Groove Centers are used with CMD Center Point Oil, they can be drawn up tight against the work, permitting closer tolerances and finer precision results. Send coupon now for details and FREE sample kit of the oil.

Heat, generated in work by cutting tools, is expelled more rapidly by the CMD Helical Groove Center. Its exclusive left-hand helical groove lubricates the entire bearing surface of the work and the center. Additional lubricant can be added without stopping the machine. No dripping or crushing out of the lubricant. Expansion of the work is kept at a minimum. For faster production, specify CMD Helical Groove Centers!

Write for FREE *Sample Kit*



CHICAGO MANUFACTURING & DISTRIBUTING CO.
Dept. 12J, 1928 West 46th St., Chicago 9, Ill.

☐Send Circular on CMD Helical Groove Centers without obligation to us. ☐Send FREE sample kit containing a tube of CMD CENTER POINT OIL and a tube of CMD CENTER POINT LUBE (grease) with directions for making an amazing, simple test.

NAME .....

FIRM NAME .....

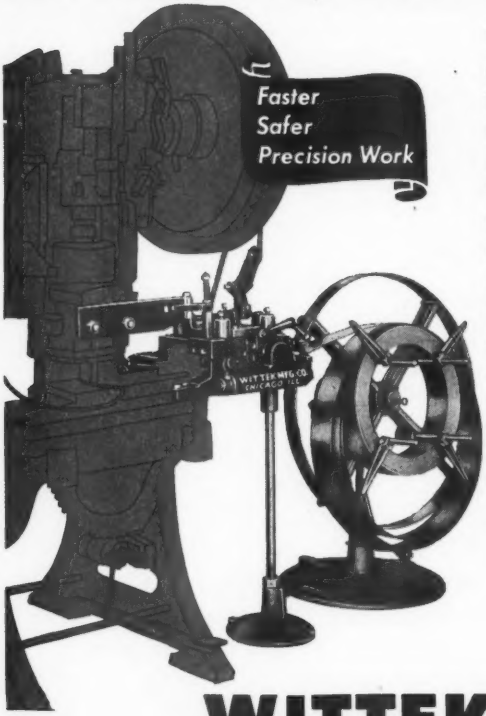
ADDRESS .....

Planning Peacetime Production Using Coiled Strip Stock?

Equip with

WITTEK

Automatic Roll Feeds and Reel Stands



Wittek Roll Feeds are being used extensively by war plants in their large volume production of high quality metal stampings. The flexibility of Wittek Roll Feeds will assist these plants in their peacetime conversion through their adaptability to various jobs. Keen competition will demand the utilization of equipment to its point of highest efficiency. If your postwar plans include punch press production of parts from coiled strip stock—investigate now the many possibilities of Wittek Roll Feeds and Reel Stands.

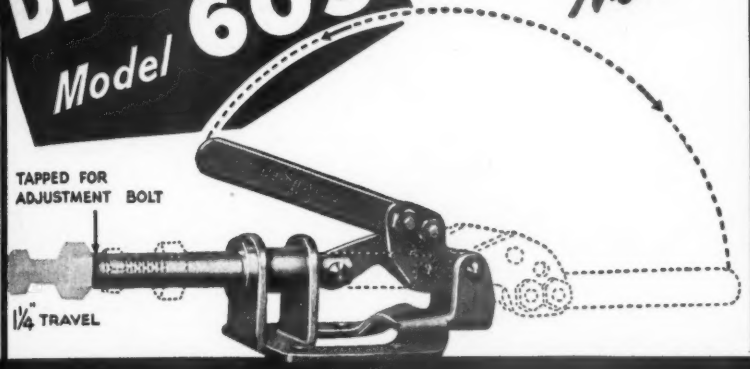
Write for catalog, prices and recommendations

WITTEK
MANUFACTURING CO.
4305-15 W. 24th Place, Chicago 23, Ill.

Automatic
ROLL FEEDS
AND
REEL STANDS

DE-STA-CO Model 605

It's New!



"PUSH AND PULL LOCK" CLAMP

Especially well suited for locating and indexing, fills a definite need on many jigs and fixtures. Work end (plunger rod) is tapped to receive standard bolt, which provides quick adjustment to suit the job at hand. Quickly converted from "push" to "pull" action or vice versa.

Bulletin No. 43 details this and many other labor saving De-Sta-Co toggle action clamps. *Send for your copy.*

DETROIT STAMPING CO.

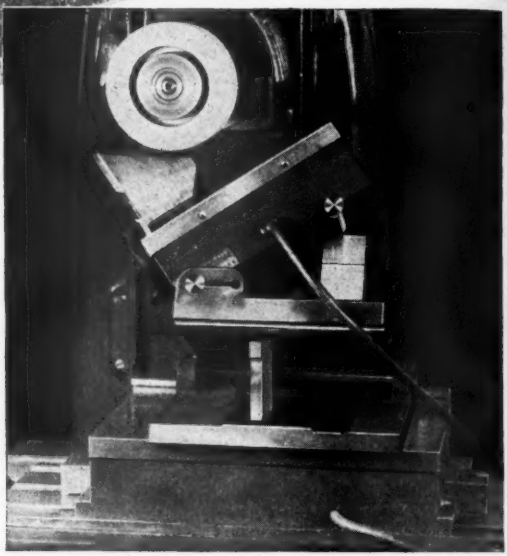
Established Over 25 Years

344 Midland Ave • Detroit 3, Mich.

40 Seconds REQUIRED TO MAKE THIS SET-UP

with The

MAGNA SINE



That's all, just 40 seconds after he had read the angle on the print the machine operator had looked up the proper gage block in the Magna Sine Table of Constants and had placed the block in position. By simply placing the work on the table and turning the switch he is ready to grind. That is all there is to any angular set-up with the Magna Sine. To make a similar set-up with a sine bar and conventional methods would require at least 1¼ HOURS. And the Magna Sine set-up is more accurate and more secure than a set-up requiring the use of clamping devices.

The time saved by the use of the Magna Sine will more than offset its cost in a few days where an average amount of angular grinding work is done. Write today for full information on how you can increase the efficiency of your grinders and other machines requiring angular holding devices.

The Magna Sine is available in two sizes and two models. The Non-Magnetic Robbins Sine Plate of the same design and fine workmanship is also available.

Robbins ENGINEERING COMPANY

318 MIDLAND AVE. • DETROIT 8, MICHIGAN

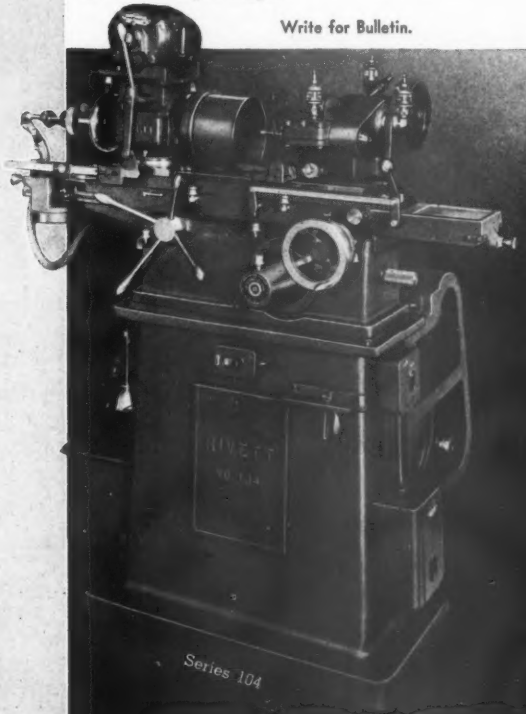
RIVETT

INTERNAL-EXTERNAL GRINDERS FOR DIE AND TOOL-ROOM WORK

Rivett grinders are particularly suited to the diversified work of the tool-room. Available internal and external spindles, ease of set-up and many adjustments, make practical a wide variety of grinding operations.

Two sizes of Rivett grinders are offered to cover the normal range of tool-room work. Series 104 has grinding capacity up to 3" diameter by 4" length. Series 112 has grinding capacity up to 8" diameter by 8" length.

Write for Bulletin.

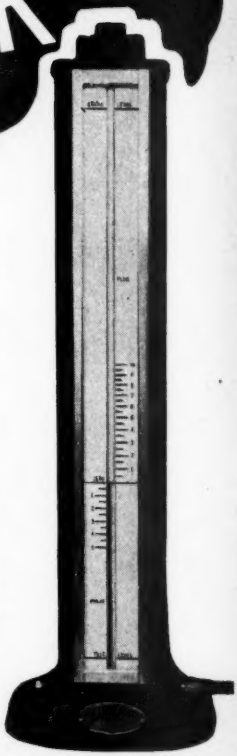


Series 104

ARMY E NAVY

RIVETT LATHE & GRINDER INC.
BRIGHTON, BOSTON, MASS., U.S.A.

The METRICATOR



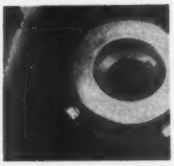
For **PRECISION MEASUREMENTS** *of*

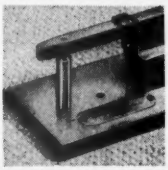
INTERNAL DIAMETERS
EXTERNAL DIAMETERS
TAPER AND STRAIGHTNESS
SLOTS AND THICKNESS
CONCENTRICITY AND ALIGNMENT

All METRICATOR gages are custom-built—engineered to meet your specific needs, assuring you of greater adaptability and guaranteeing precision accuracy.

METRICATOR gages eliminate human element variations and maintain their high degree of accuracy for a longer period of time in spite of wear.

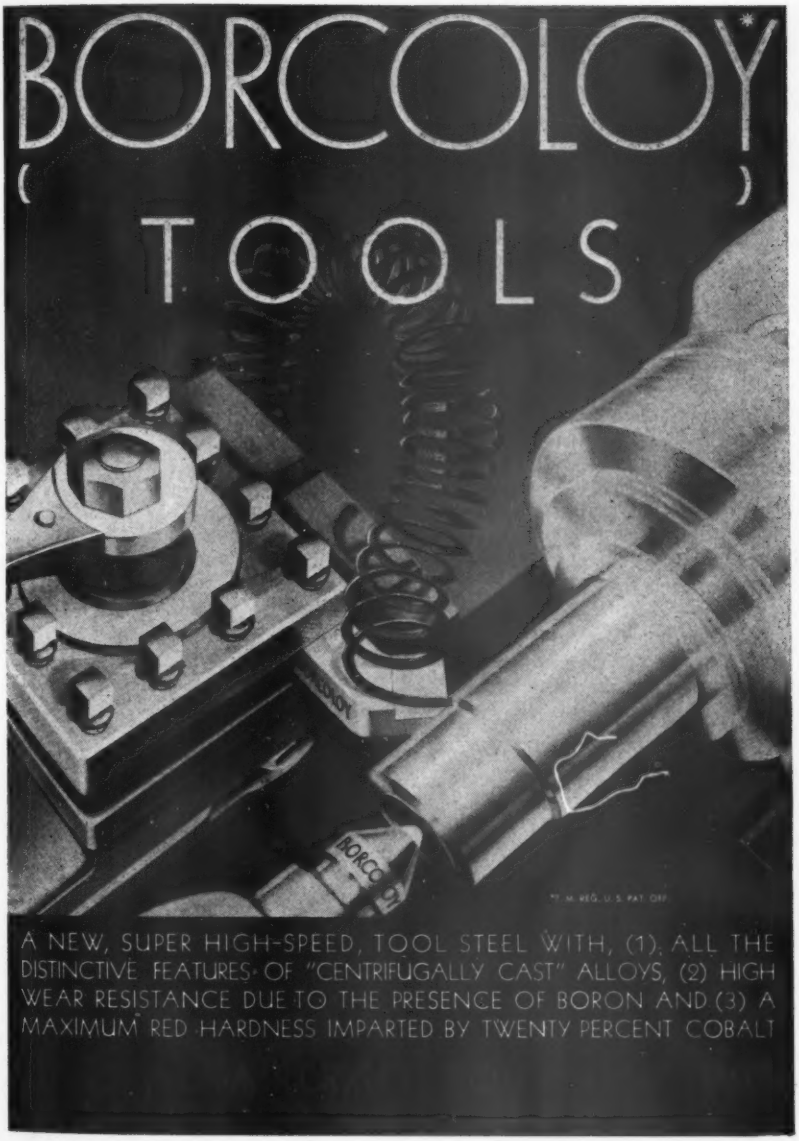
SEE THE METRICATOR IN OPERATION IN YOUR OWN PLANT . . . SOLVING YOUR TOUGHEST GAGING PROBLEM.





Write Today for Illustrated Literature

Metrical Laboratories, Inc.
ANN ARBOR, MICHIGAN



A NEW, SUPER HIGH-SPEED, TOOL STEEL WITH, (1) ALL THE DISTINCTIVE FEATURES OF "CENTRIFUGALLY CAST" ALLOYS, (2) HIGH WEAR RESISTANCE DUE TO THE PRESENCE OF BORON AND (3) A MAXIMUM RED HARDNESS IMPARTED BY TWENTY PERCENT COBALT

The JIGMIL has proven to be a totally new approach to the problems of economical precision BORING and milling of tool and production work

THE fastest producing and most accurate machine in the field.

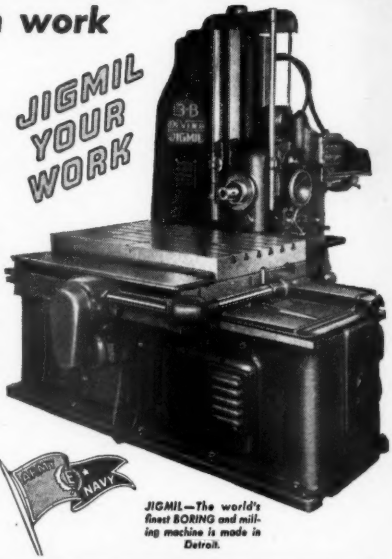
Many users are reporting consistent experience of two to three times the output and higher quality work.

Automatic positioning of spindle from one location to another in response to measuring rods and push buttons to within less than .0001 (one ten-thousandth part of an inch).

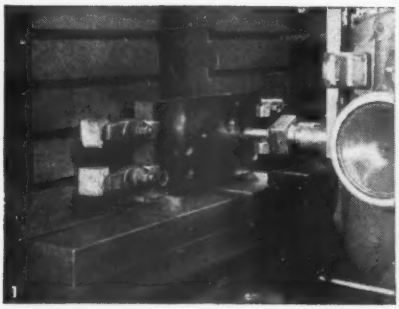
Feather touch, pressure controlled slide locks that positively control locking uniformity, so essential to high precision work.

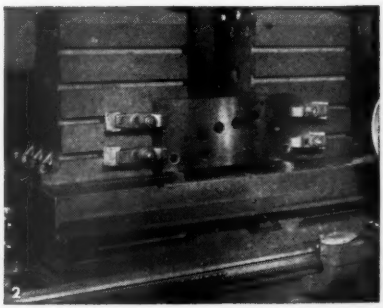
Unique operation and controls that make possible high precision work with relatively little skill.

★ ★ ★



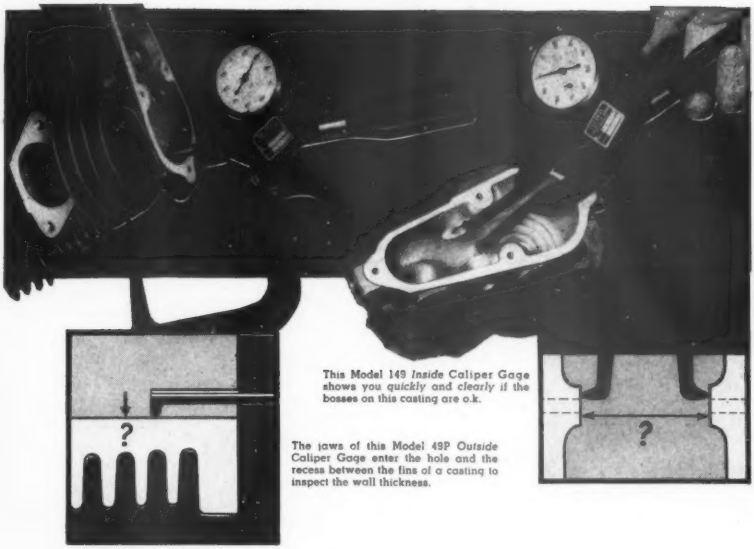
JIGMIL—The world's finest BORING and milling machine is made in Detroit.





★ No. 1—Illustration showing convenience of jig plate boring. No. 2—Eight holes precision bored. Holes spaced within .0001 with total dependence of all spacing on automatic positioning means.

DeVLIEG MACHINE COMPANY DeVLIEG JIGMIL **450 FAIR AVE. FERNDALE 20, (Detroit) MICH.**



This Model 149 *Inside* Caliper Gage shows you *quickly* and *clearly* if the bosses on this casting are o.k.

The jaws of this Model 49P *Outside* Caliper Gage enter the hole and the recess between the fins of a casting to inspect the wall thickness.

The Easiest Way to Inspect OUTSIDE *and* INSIDE *DIMENSIONS* - - - - -

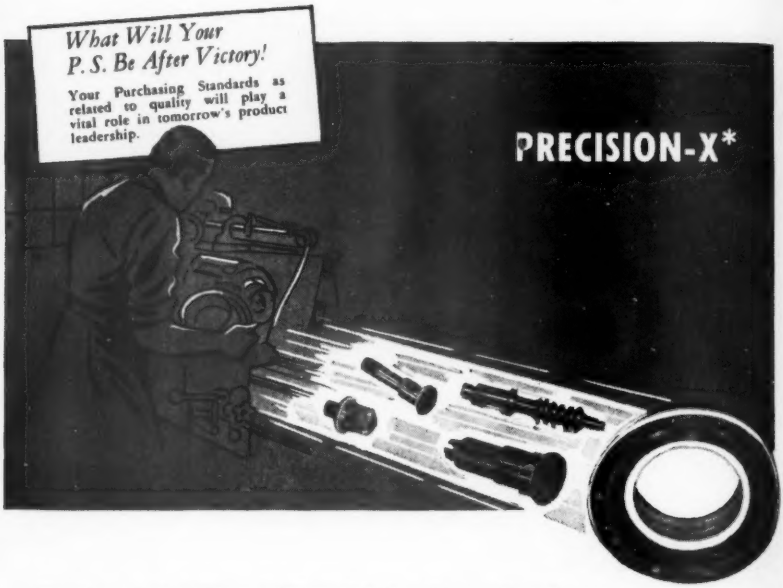
Dimensions do not have to be limited to fine tolerances in order to get a lot of use from these gages. Their greatest value is their convenience — their quick, easy and direct way of getting into odd positions and telling you whether a dimension is right or wrong, and *how much* wrong. The jaws can be made in every conceivable shape to get practically into any position.

The Model 49 *Outside* Calipers and the Model 149 *Inside* Calipers are equipped with Dial Indicators graduated in .01" or 1/64". They can be furnished for comparing dimensions or for direct measurements. Though not high precision instruments, they are exceptionally popular calipers. Their use has saved many times their cost, time and again. It will pay you to use them rather than take a chance on many a job. Use them on patterns, cores, castings, forgings, tubing, shells, bottles, plastics, formed shapes; in fact, any irregular shaped workpiece. Ask us about a gage with jaws designed to fit your work.

FEDERAL PRODUCTS CORPORATION
1144 EDDY STREET, PROVIDENCE 1, R. I.

BRANCH OFFICES
CHICAGO • CLEVELAND • DETROIT
DALLAS • HARTFORD • HOUSTON
INDIANAPOLIS • LOS ANGELES
MEMPHIS • MILWAUKEE • MINNEAP.
OLIS • MONTREAL • NEW YORK
PHILADELPHIA • PITTSBURGH
ROCHESTER • SAN FRANCISCO
ST. LOUIS • TORONTO • WINDSOR

★ ★ ★ ★ ★ FEDERAL ★ ★ ★ ★ ★


What Will Your P. S. Be After Victory!
Your Purchasing Standards as related to quality will play a vital role in tomorrow's product leadership.
PRECISION-X*

Delivers the *Extras* That Make *Better* Products

Precision-X by Smillie goes beyond ordinary precision. Whether it's precision parts, tools or fixtures, Precision-X* assures specific *extra* values that count in product performance.

Such as skilled engineering control . . . designing and building our own tools and gages . . . modern equipment for machining, milling, thread milling, grinding, finishing, inspection and skilled craftsmen who aim for the best.

Typical of Precision-X production has been the increasing volume of vital parts for aircraft, ordnance and the Navy that C. M. Smillie Company has been producing for Victory.

Each and every part produced here has contained these *extra* values provided in Precision-X. In over-all product performance they have meant fewer flaws, smoother operation, longer life. After victory, these *extras* in Smillie Precision-X will do the same for your product.

That's why in your purchasing standards related to quality you can expect these Smillie *extras* to count for more.

PRECISION-X*
by Smillie
Means the Extra Values In All Three
1. PRECISION PARTS
2. TOOLS
3. FIXTURES

C. M. SMILLIE & CO.

1100 WOODWARD HGTS. FERNDALE 20, MICH.

TOOLS PRECISION SCREW MACHINE PRODUCTS FIXTURES

SMILLIE CORE BOX VENTS

Scully-Jones Tap Chucks

STYLE "A" TAP CHUCKS have five big advantages for driving taps:

- Drive by the square—giving a positive drive.
- Centers by the shank—for correct alignment.
- Spring collet action—for locking tap in chuck.
- Four point bearing—giving collet action
- A tapered shank—fits any MORSE TAPER HOLE.

RECOMMENDED FOR MAXIMUM RIGIDITY AND CONCENTRICITY IN TAPPING OPERATIONS

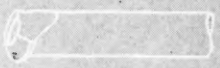
SCULLY-JONES AND COMPANY

1901 SO. ROCKWELL STREET • CHICAGO, ILLINOIS, U.S.A.

ONE TOOL did all this!

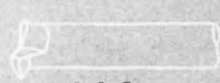
. . . Bored and bottomed the large blind hole—then faced the stepped surfaces.

BOKUM SINGLE POINT CUTTING TOOLS



Style A—
for general boring

Style B—
for bottoming and facing



Style C—
for threading

ALL WITH ONE BOKUM BOTTOMING AND FACING TOOL (STYLE B)

Helical back off insures constant clearance and extremely long life of tool, since sharpening is done by grinding face only. Why use two tools when the job can be done with one?

Ask for Catalog E-1139 for Super High Speed Tools, and for E-398 for Carbide Tipped Tools

★ BUY WAR BONDS ★

BOKUM TOOL CO.

14775 WILDEMERE AVE. • DETROIT 21, MICH.

The gage of today is NORBIDE*

The gage of today is NORBIDE (Norton Boron Carbide) because this hardest of man-made materials outwears conventional types of measuring devices 100 times and more. NORBIDE gages show exceptional resistance to abrasion and scratching; they will not pick up lint or become charged with particles of metal; they are inert to chemicals ordinarily employed where gages are used. NORBIDE blanks for plug, ring, snap and key way gages and NORBIDE contact points for dial indicator gages can be obtained from your regular gage supplier. For further information on NORBIDE gages write for booklet No. 1100 to:

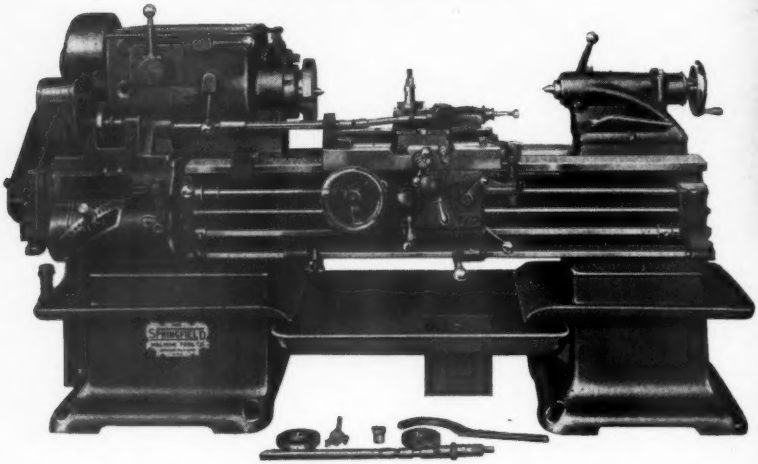
NORTON COMPANY

Worcester 6, Massachusetts

*Hardest Material Made by Man

SPRINGFIELD PRECISION LATHE

Out in front!



● Headstock . . . twelve speeds . . . only half of the easy-shifting spur gears mesh at one time.

Motors . . . V-Belt or silent chain drive.

Bed . . . permanently true—made of high test alloy to resist warp or marring under severe service.

Apron . . . extra heavy—operates on Ball and Bronze bearings throughout.

Taper attachment . . . hair-trigger adjustment.

Compound rest . . . sturdy, firm.

Tailstock . . . all bearings and bed ways oiled from one well.

From headstock to tailstock—the SPRINGFIELD Lathe is *out in front!*

SEND TODAY FOR BULLETIN No. 163

Tells the why and how of Springfield's accurate production.

THE SPRINGFIELD MACHINE TOOL CO.

SPRINGFIELD • OHIO, U. S. A.

CHECKING TIME REDUCED TO SECONDS

The wide utility of the Wilder Projector together with its speed, elimination of human "feel", and reasonably low price make it possible for many plants to use dozens of these time-saving inspection instruments to great advantage for precision checking of work, gages, machine settings, tool wear, etc. Instead of requiring three or four steps, such as are involved in older methods, the WILDER PROJECTOR does the work in one step and with greater accuracy even with unskilled help.

A FEW USERS HAVING 10 OR MORE "WILDERS"

General Electric Company
Western Electric Company
Sylvania Electric Products, Inc.
Ford Motor Company
Bendix Aviation Corporation
Picatinny Arsenal
General Motors Corporation
Ex-Cell-O Corporation
The Geometric Tool Company
Springfield Ordnance District
Henry L. Crowley Company

Write for Bulletin giving complete details on the "WILDER" and its outstanding advantages in fast, wide-range optical inspection.

GEORGE SCHERR CO.

200-B LAFAYETTE STREET
NEW YORK 12, N. Y.

LET US DESIGN YOUR TOOLING FOR PEACETIME PRODUCTION NOW

Here's the ideal way to get ready for civilian goods production — **without taking your attention away from your vital war production job.**

In our Engineering Department, we have 45 Designing Engineers at your service — ready **now** — to design your special tools, special machinery, dies, jigs, and fixtures and to develop complete products.

Then, when you give us the go-ahead, we'll be ready to **build** your peacetime production tools and follow through with parts manufacture if desired. In this way, you'll be weeks ahead of competition.

Take advantage of our complete facilities, equipment and know-how, backed by 24 years of experience. Phone, write or wire us. We invite submission of prints.

THE BUNELL MACHINE & TOOL COMPANY

1601 EAST 23RD STREET • TELEPHONE CHERRY 0343 • CLEVELAND 14, OHIO

Chamber of Commerce award as the best small industrial plant completed in 1941-42.

LARGE PRODUCTION MACHINE WORK

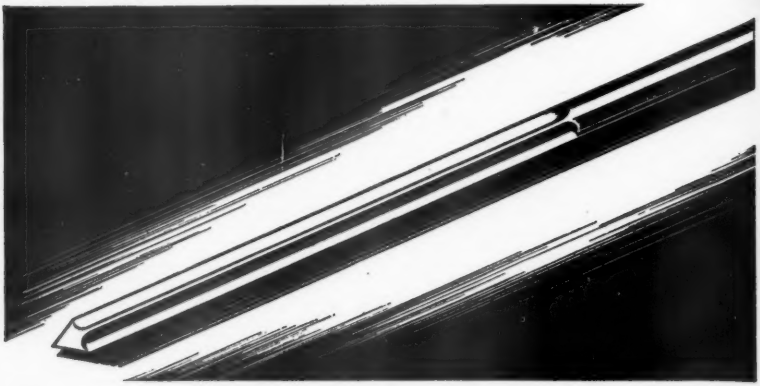
Cutbacks will make available some of our modern facilities for machine production of medium and large parts, including assembly.

If you have or expect to have work of this nature to place, be sure to let us quote — or we will be glad to discuss your future requirements — without obligation, of course.

DESIGNERS AND MANUFACTURERS OF

Tools • Special Machinery • Dies • Jigs • Gages • Fixtures

PRECISION PRODUCTION OF PARTS AND ASSEMBLIES



2000 HOLES PER REAMER —Instead of only seven!

Here is a war-production fact that sounds fantastic—yet its truth brings striking evidence of the superior performance of L & I Ground Flute Reamers, when they replace ordinary milled flute reamers.

The Oilgear Company of Milwaukee reports that with milled flute reamers they were usually unable to complete with one reamer the seven holes required in an important piece. They are now using L & I Ground Flute Reamers and are producing an average of nearly 2000 holes per reamer.

If you haven't tested the keener cutting edge and longer life of L & I Ground Flute Reamers against the ordinary milled flute reamers you are now using, why not send us a trial order—or write for literature?

L&I GROUND FLUTE REAMERS

LAVALLEE & IDE, INC. CHICOPEE, MASS.

Check and Double Check..

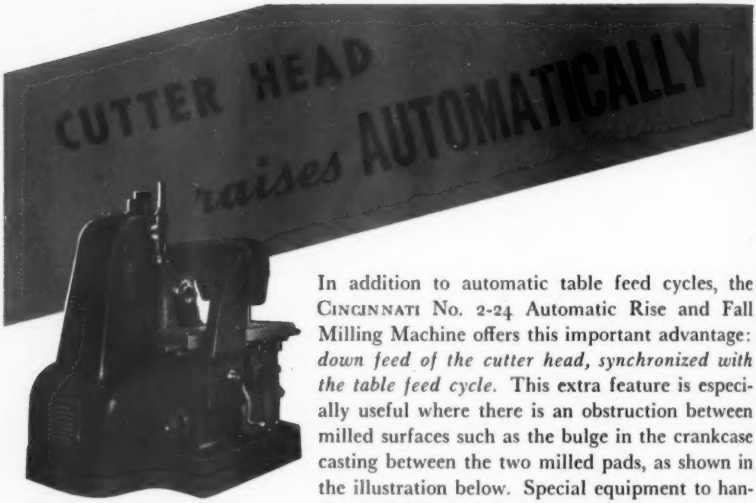
...before this stamp of Precision appears on TURNER Gauges

THE VERY last operation performed on any Turner Gauge before packaging is the application of the Turner Stamp, which you see reproduced above. Prior to this, every Turner Gauge has been checked and double checked in our air conditioned, temperature controlled inspection room. *It is your guarantee that all checking surfaces are accurate to your specifications.*

★ *We make cylindrical plug gauges, Plast-O-Lock plug gauges, cylindrical ring gauges, special flush pin gauges, solid type snap gauges, Master Discs, and built-up gauges.* ★

TURNER GAUGE GRINDING COMPANY

2675 MILTON ROAD • • KENDALL 2, MICHIGAN

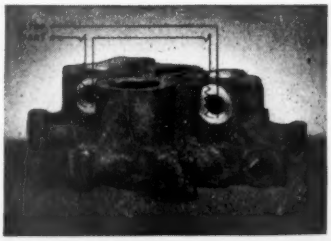


CINCINNATI *No. 2-24 Automatic Rise and Fall Milling Machine. Catalog M-909-1, giving complete specifications, is yours for the asking. For a brief description of all* CINCINNATI *Milling Machines, look in Sweet's Catalog File for Mechanical Industries.*

In addition to automatic table feed cycles, the CINCINNATI No. 2-24 Automatic Rise and Fall Milling Machine offers this important advantage: *down feed of the cutter head, synchronized with the table feed cycle.* This extra feature is especially useful where there is an obstruction between milled surfaces such as the bulge in the crankcase casting between the two milled pads, as shown in the illustration below. Special equipment to handle this job included: fixture, cap type arbor support to fit over extended shell end mill, and special cycle selector to mill down in two accurately located positions of table. ¶ This setup was developed by the CINCINNATI Application Engineers who will be glad to discuss your milling problems with you in an endeavor to work out a more accurate or more economical way of handling them.

CINCINNATI

Illustrated at the right is a close-up of part being milled on the equipment shown in the photograph on the opposite page. Also shown is a diagram of the automatic cycle.



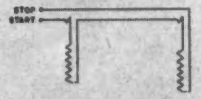
THE CINCINNATI MILLING MACHINE CO.

TOOL ROOM AND MANUFACTURING MILLING MACHINES · SURFACE BROACHING MACHINES · CUTTER SHARPENING

allowing obstruction to pass

Milling two pads on rear crankcase for aircraft engine. The machine is a CINCINNATI *No. 2-24 Automatic Rise and Fall Miller After loading the fixture, the operator merely flips the starting lever and nine functions of the milling cycle follow automatically, including return of the table to the starting position.*

Here are the nine automatic steps in the cycle:



START CYCLE.

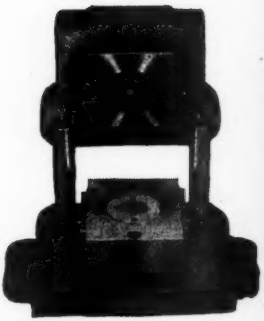
1. Table rapid advances and cutter starts.
2. Table feeds to accurate cutting position.
3. Table stops. Cutter head rapid advances down, trips to feed rate and mills pad.
4. Cutter head rapid returns to top of stroke.
5. Table rapid advances to next cutting position.
6. Table feeds to accurate cutting position.
7. Table stops. Cutter head rapid advances down, trips to feed rate and mills pad.
8. Cutter head rapid return to top of stroke.
9. Table rapid returns to starting position and cutter stops.

CINCINNATI GRINDERS INCORPORATED CINCINNATI, OHIO, U.S.A.
MACHINES . . . CENTERTYPE GRINDING MACHINES . . . CENTERLESS GRINDING MACHINES . . . CENTERLESS LAPPING MACHINES

Once you use HOVIS UNIVERSAL MASTER WASHER DIES you'll never go back to the old, slow and expensive method of making a new die for each size and type of washer. Instead, you make a nominal investment in Master Washer Dies and then simply use 5 small, easily removable, interchangeable parts to make any size washer.

WHEN YOU BUY FOR WAR PRODUCTION YOU INVEST IN PEACETIME EQUIPMENT

The Master Dies themselves do not become obsolete. Many of them have been in use for nearly five years. So all you need to consider are the 5 interchangeable parts for each size washer whether for wartime or civilian production. Write today for illustrated literature.



Made in 5 sizes:
$\frac{3}{4}$"—1$\frac{1}{2}$"—2$\frac{1}{2}$"—4"—6".

HOVIS SCREWLOCK COMPANY

8100 E. NINE MILE ROAD
Suburb of Detroit

VAN DYKE, MICHIGAN
Phone: Centerline 1575

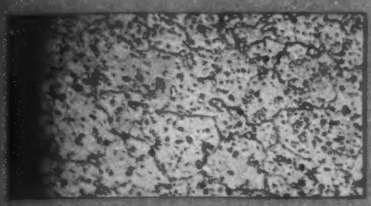


Figure 1—750X—Edge structure of Tungsten-Molybdenum type high speed steel treated in Park No. 175 High Heat Salt for seven minutes at 2200° F. Note absence of decarburization in the "as quenched" structure.

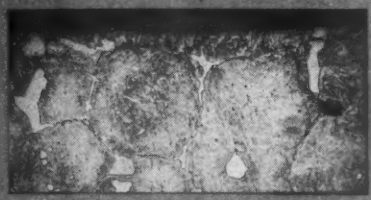


Figure 2—500X—(Reduced in printing)—Edge structure of a high speed steel tool after several hours immersion in a Park No. 175 High Heat salt bath. Note large grain size, carbide distribution, and absence of decarburization.

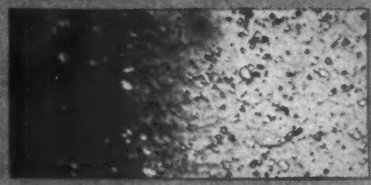


Figure 3—750X—Edge structure of a hardened and drawn high speed steel tool after treatment in Park No. 90 Casing Salt. Note the dark etching nitride "case" which is responsible for the improved cutting ability and longer life shown by tools receiving this treatment.

It's the *cutting edge* that counts!

NO OXIDATION, decarburization or pitting occur when high speed tools are heat treated in Park salt baths.

Park High Speed Salt Baths are formulated to provide easily maintained neutrality. They are balanced to minimize the effect of carry-over and facilitate cleaning.

Park

HIGH SPEED SALT BATHS

No. 117 High Speed Steel Preheat Salt
No. 175 High Speed Steel High Heat Salt
No. 100 High Speed Steel Quenching Salt
High Speed Steel Drawing Salt
No. 90 High Speed Steel Casing Salt

★ ★ ★

There is a Park Service Engineer in your territory who will be pleased to assist you in realizing the maximum benefits of Salt Bath heat treatment. Write today for the address of the Park representative nearest you.

Park
PARK CHEMICAL CO.

Liquid and Solid Carburizers—Cyanide, Neutral and High Speed Steel Salts—Lead Pot Carbon—Charcoal—Coke—No Carb—No-Kase—No-Trida—Carbon Preventer—Quenching and Tempering Oils—Drawing Salts—Metal Cleaners—Liquid Grain Cement.

8074 MILITARY AVE. DETROIT 4, MICHIGAN

SPECIALISTS IN HEAT TREATING SINCE 1911

TURRET LATHES

Although like most old-established contract shops, we are extra-busy these days—from time to time we do have open hours that we can fit your requirements in to meet an urgent delivery date.

Whether it's work for an old customer or a new one, the entire Star organization takes pride in doing the kind of a job that will make them want to come back. We invite your inquiries on any contract shop work.

Designers and Manufacturers

OF DIES • JIGS • FIXTURES • GAGES • SPECIAL MACHINERY • JIG BORING • PLANER EQUIPMENT

STAR ★
MACHINE & TOOL COMPANY

9320 Woodland Ave • Cleveland 4, Ohio

EDITORIAL INDEX

Features

	Page
Selection of Precision Taps, by R. R. Williams	90
Adjustable Circular Form Tool Holder, by George C. Brown	92
Copper Segment Blanking Die, by Alex S. Arnott	94
Design of a Turret Head for a Standard Lathe, by Lee Brady	96
Carbide Machining of Steels on Automatic Screw Machines, by Carl W. Blade	98
Meehanite Tool Castings	100
Materials Weight Tables, Part VIII, by Geo. H. Thompson	102
Design of Molded Plastics Parts—Contour Design—Part IV—Holes and Undercuts, by Warren V. Prince	106
Estimating Systems for Plastics Molding, by Gordon B. Thayer	111
SPI Fall Conference	117
Precision Dies Open New Fields for Molding Engineers' Scales	119
Flying Bazookas Utilize Plastic Tubes	122

Briefs

Lathe Chuck Stand Facilitates Parts Storage	170
Honan-Crane Purifier	172
Light-Wave Tool Measures Parallelism	174
New Madison-Kipp Hand Grinder	176
"Shankless" HSS Roll-Forged Drills	178
Sanford Heads Die Casters	180
Lyon Blueprint Cabinets	182
Denison Multipress	184
New Berger Hand Tapper	188
Air or Gas Testing Units	190
Woodworth Precision Gages	192
Aber Curved Tooth Milling Cutters	194
New Improved Gusher Pumps	196
Tool Steel Tubing Applications	198
Defiance Heavy Duty Driller	200
New Push-Out Collet Chuck	202
Colored Finishes Now Permitted on Machine Tools	202
Thomas Disintegrator	212
New Kennametal "Clamped-on" Tools	220
Numberall Spanner Wrench	222
New Insulation Tape	224
New Method Cuts Sprocket Machining Time in Half	225
A New Cincinnati Drive for Micro Mills	226

Coming in January

A Blanking and Forming Die
Tooling for Stretch-Band Working
Tool Room Surface Grinding—Part III, by J. E. Corbett
The Geometry of Laying-out, Principles and Practice
A Procedure on Cast Resin Technique
Design of Plastics Parts and Molds—Part V, Inserts, by Warren V. Prince

When Jack hangs up his uniform
—FOR GOOD...

IT'S been a long time since Jack made his last call as salesman for your *Industrial Supply Distributor! It may be a little while yet before Uncle Sam cancels his present contract . . . the one he signed way back when things weren't going so well for our side.

But after the V-Day excitement has all died down . . . after this war situation is finally settled for once and for all . . . you can be sure Jack will see that you receive the same efficient, courteous service as before.

In the meantime, your *Industrial Supply Distributor is doing everything in his power to take care of your needs both quickly and efficiently. It's not always easy to have just what you want in stock at the time you need it, so you can help him serve you better by ordering as far in advance as possible.

For equipment, materials and supplies, don't forget to . . .

Telephone your I S D FIRST!

ARMY NAVY

ARMY E ★★ NAVY

The CLEVELAND TWIST DRILL COMPANY
1242 EAST 49th STREET
CLEVELAND

50 THOMAS ST. NEW YORK · 9 NORTH JEFFERSON ST. CHICAGO · 650 HOWARD ST. SAN FRANCISCO
6600 SECOND BLVD. DETROIT · LONDON • S. P. BARRUS, LTD. • 20-30 UPPER THAMES ST. EC4

CLEVELAND DISTRIBUTORS EVERYWHERE ARE READY TO SERVE YOU

★

TO OUR READERS

It is natural that the Christmas season should bring thoughts of "Peace on earth, Good Will toward men".

In this year of world-wide conflict there is the greatest need for Faith, Hope and Charity:

Faith in God, our Country, our fellow men,

Hope toward the day when peace will again be upon the earth, and

Charity toward every man, woman and child who needs and deserves our help.

★ Members of the TOOL & DIE JOURNAL Staff

BETTER TOOLING

Hope Of The Future

FOR ten years we have been writing and talking about the fundamental nature of the dies, molds, jigs, fixtures, gages, special machines and accessories which to such a large extent have made American mass production possible.

We have repeatedly ventured the opinion that manufacturers who have made the most notable production progress during the last twenty-five or thirty years are those who have developed the most ingenious tools and tooling methods, and particularly those who have realized that the best tools are the least expensive.

For several years Kearney & Trecker have recognized a service which they can render to American industry beyond being builders of good milling machines. They have repeatedly co-operated with the men who design, develop and build special production tools, dies and molds. Throughout the years they have developed a special department in which they would make a die or

mold for a tool shop operator under his observation or of one of his keymen. An announcement of this service appeared in TDJ of July of this year.

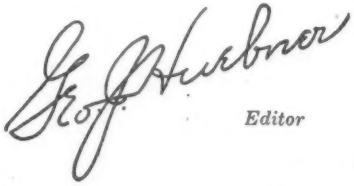
Now another important builder of machine tools, accessories and other types of production tooling declares: "Remember, tools and tooling will play a more vital part in the future of American industry than ever before. From the one-man business to the largest industrial enterprise, better tools and tooling are the hope of the future".

Gradually but surely we are thus experiencing the acceptance of the fundamental fact that a part or product is only as good as the tools which process it. The Pratt & Whitney statement quoted above appears in their publication "Backgrounds" in which you are invited to play an interesting new game entitled "Try Your Hand at 'Tool Shop'". With your architect, you plan your building—modern to the last word. Then you select your equipment. To make it more exciting Pratt & Whitney offer you a selection of their well-known machine tools intended for machining the parts of medium size precision dies and fixtures along with some "bread and butter" bench work on precision sub-assemblies. Your third step gives you an opportunity to lay out your shop and argue for your floor plan against Pratt & Whitney experts.

The invitation to play "Tool Shop" is open to the tool or die or mold maker who one day hopes to establish "his own". Today he may be working in a contract shop or in the inside tool room of a production plant. Perhaps the player is a small operator ready for expansion or he may be a manufacturer who has been thinking about his tool room as a necessary evil instead of the department which increases product profit.

Thus briefly we describe to you what constitutes a thoroughly thought-provoking idea, one whose influence toward the design, construction and use of better tooling can be very far-reaching indeed.

It is a great game for "profit-minded" tool men. You may begin with a "dream shop" but here in America with the right amounts of serious thinking and efficient action your dream can become a reality. Who dares to say it will not?



Editor

SELECTION OF PRECISION TAPS

by R. R. Williams

Thread Engineer

During the prewar years of machine and automobile manufacture most of us gave little, if any, thought to the selection of taps other than to specify the size, number of threads per inch and material to be tapped. On machine drawings very few hole limits were closer than Number 2 and the thread finish was not considered important. I think that what we then called a good finish is now hardly passable.

Under present conditions where every bolt, nut and screw is stressed to the maximum because of the necessity of weight reduction, the finish and fit of an external or internal thread is of major importance.

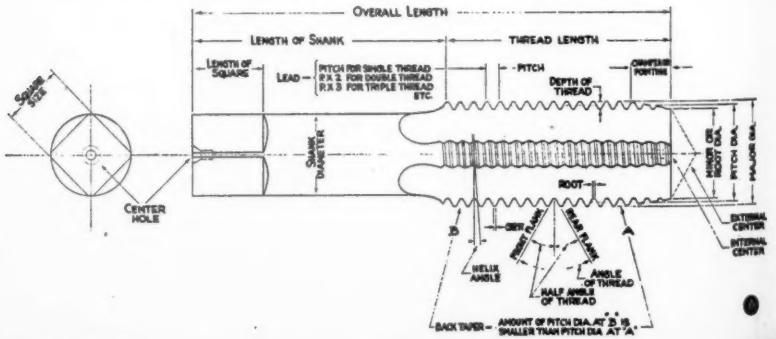
In a previous article in Tool & Die Journal, July, 1944, there is a drawing (Reproduced herewith for reference. Ed.) illustrating the various shapes of flute grinds; the radial, the rake and the hook grind. Most tap manufacturers have done a great deal of experimenting to determine the proper flute for various materials and conditions, and also to establish when the added chip clearance of a two or three flute tap is needed.

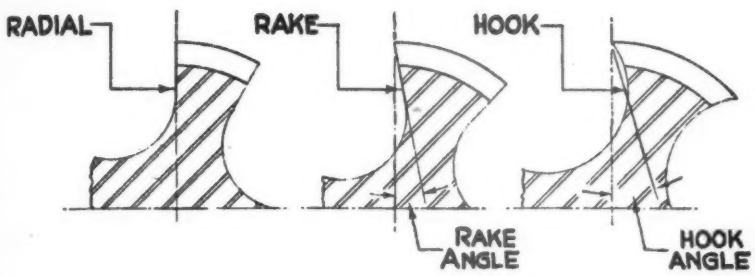
Specifications by Purchaser

It is obvious then that a buyer should specify when ordering taps (if he wishes the tap manufacturer to assure the proper tap) first, the nominal size of the tap, the number of threads per inch, and a description of the material, as hard tough steel and the S.A.E. number, if possible. Then the hole limit, as, to tap No. 3 limit hole. Next, the condition under which the tap is to perform, as, to hand tap or to be used in a machine; likewise the length of thread if a thru hole, and the depth of thread if a blind hole; also, the depth of drill on a blind hole.

In selecting the proper P.G. size tap to buy, if one will consider that no matter whether the tap hole limit is number 1, 2, 3 or 4, the GO size of the thread plug is always the same and only the NOT GO changes, it then becomes obvious that any tap that will make a threaded hole large enough to admit the GO thread gage will at least be large enough from the standpoint of size.

Next, we should consider the life of the tap, or the number of holes that can be tapped between point grinds. This





takes into account whether the tap is for a number 1, 2, 3 or 4 limit hole. To get the greatest amount of life we should have a tap that will permit the entry of the NOT GO gage about one and one-half turns. This means that the tapped hole is either at, or very close to, the high limit.

As an example let us consider a three-eighths sixteen, number 4 limit hole. The basic pitch diameter, or GO gage size is .3344 and the NOT GO is .3360, a difference of .0016. As we know from experience that a tap can be expected to cut somewhat larger than its own pitch diameter (the reason for this has been explained in the previous article), a tap must be selected that will be under the NOT GO size. This will limit our selection to a number 01 or 1 Precision Ground Tap. The number 1 P.G. tap should be our selection as the high limit on this size is .0011 under the NOT GO gage. This will make enough allowance in most cases for the amount that the tap will cut larger than its own P.D. and will give far greater life than a 01 P.G. tap.

New Taps Cut Oversize

The occasional number 1 P.G. tap that does cut oversize can be brought down by tapping a few holes in cast iron, or by brushing off its wire cutting edge with a wire hand brush. Most mechanics realize that a new tap with keen cutting edges cuts .0002 to .0003 larger than after a few holes have been tapped. Now if a 01 P.G. tap was selected, the greater percentage of its work would be undersize after the initial wear and it would have to be reground at the point.

Any tap to be used for a number 4 limit hole should be precision ground in the flute as the amount the tap will cut larger than its own P.D. is reflected in the accurately symmetrical spacing of the flutes.

Where a number 3 limit hole is desired, the difference of .0032 between the GO and NOT GO gives a better chance to select taps. Here a No. 2 P.G. tap, in most cases, gives satisfactory life, but where the material to be cut is of a nature to cause excessive wear a No. 3 P.G. tap may be used.

Selection of taps for number 1 and 2 limit holes will have to be made with the finish kept in mind, as any tap that will do for a number 3 limit hole will answer for a number 1 or 2, and in addition a cut thread and commercial ground tap may be used.

Tap Testing Requirements

In testing taps we should bear in mind that taps should be tested in the same material as they are to be used and under the same conditions. If the tap is to be used with a hand wrench, it should be so tested. If the tap is to be used in a machine, it should be tested in the machine and the spindle chuck should hold the tap true. Often where sliding fixtures are used, the fixtures are so heavy that the tap cannot be accurately aligned with the hole and an oversize hole will result. In some cases where holes are drilled on one machine and tapped on another, the holes to be tapped are not parallel to the axis of the second spindle and an oversize hole is the result.

My experience has been that 75% of poor tap life and tap trouble in general is caused by improper tapping conditions that can be avoided by exercising reasonable care.

ADJUSTABLE CIRCULAR FORM TOOL HOLDER

by George C. Brown, M. E.

McQuay-Norris Mfg. Co.

Frequently, set-ups on multi-spindle bar chucking machine tools require one cross slide forming operation of widely separated but dimensionally related surfaces. Whenever practicable, the cheapest and most flexible set-up will consist of two separate circular form tool holders.

Operators and set-up men have always complained, however, that the standard circular tool holder does not permit raising or lowering of the individual tool centerline for center height adjustment. Moreover, with two blocks on any one slide, adjustment of the separate tools parallel to the slide motion is impossible. These comments are not without merit and records show unnecessary loss of time in machine set-ups.

The standard block has a square hole for the tool clamping stud. The centerline of this hole presumably locates the circular tool cutting edge at the proper cutting angle and on the cutting center of the work. Practical experience soon indicates that this condition is variable, especially if the blocks have been used appreciably and the machine cross slides are worn. Obviously the situation becomes extremely bad when two tool blocks are in use on the same slide and required to produce a good finish and close dimensional limits.

However, a very simple change in block design, plus a small amount of labor in your machine repair department completely eliminates these difficulties, as the attached drawing shows.

The square hole has been bored out to a close tolerance diameter. Into this hole is fitted a flanged bushing. The bushing I.D. and O.D. are .031 eccentric permitting .062 vertical and horizontal adjustment of the inserted tool clamping stud.

Vertical and horizontal adjustment of the assembled bushing is produced by inserting a spanner wrench into the slotted bushing flange and rotating in the desired direction. Correctly locating both tools to the work piece, the bushings are locked in place with the locking set screws and never again disturbed for the set-up. Each bushing I.D. carries a keyway to mate with a woodruff key in the clamping studs. This feature keeps the stud from turning when the clamping stud nut is tightened.

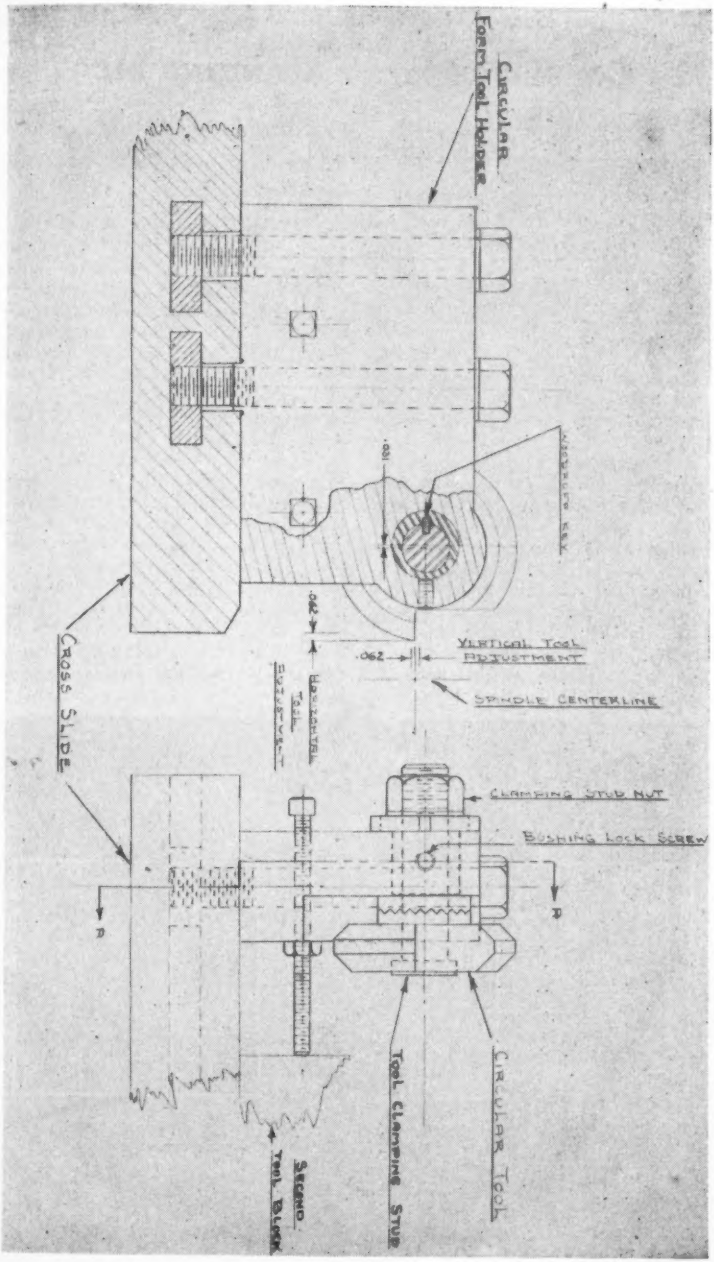
This idea can effectively reduce set-up time, and again robs the set-up man of his time old adage "Adjust it with a hammer".

CTMA ELECTS DIRECTORS FOR 1945

The Cutting Tool Manufacturers Association at its first annual meeting last month in Detroit re-elected eight and added four new directors to the board.

Among those re-elected were W. G. Robbins, Pres., Carboloy Company, Inc.; Oscar L. Bard, Pres., Michigan Tool Company; R. G. Michell, Pres., Eclipse Counterbore Co.; and George L. Buffington, Supt. of Estimating & Process Engineering, Ex-Cell-O Corp.; all elected for three-year terms. E. A. Goddard, Vice Pres., Goddard and Goddard, was re-elected for a two-year term, while Norman Lawton, Partner, Star Cutter Company; R. M. Severance, Pres., Severance Industries, Inc., Saginaw; and R. H. Wolfe, Pres., Arrow Tool and Reamer Company were re-elected for one-year terms.

New directors include G. W. Frick, Mgr., Firthite Div., Firth-Sterling Steel Co., McKeesport, Pa.; Emil Gairing, Pres., Gairing Tool Company and G. E. Sheldrick, Sr., Pres., Midwest Tool and Manufacturing Company, elected to two-year terms; and D. E. Van Deusen, Kelly Reamer Company, Cleveland, Ohio, elected for a one-year term.


Circular Form Tool Holder
.001
Woodruff Key
.062
Vertical Tool Adjustment
.062
Horizontal Tool Adjustment
Spindle Centerline
Cross Slide
Clamping Stud Nut
Bushing Lock Screw
B
B
Tool Clamping Stud
Circular Tool
Tool Block
Segmental

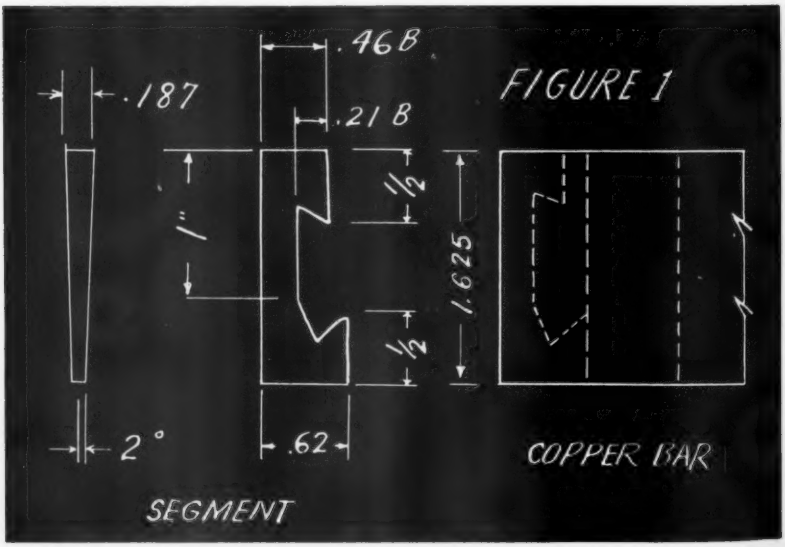
Copper Segment Blanking Die

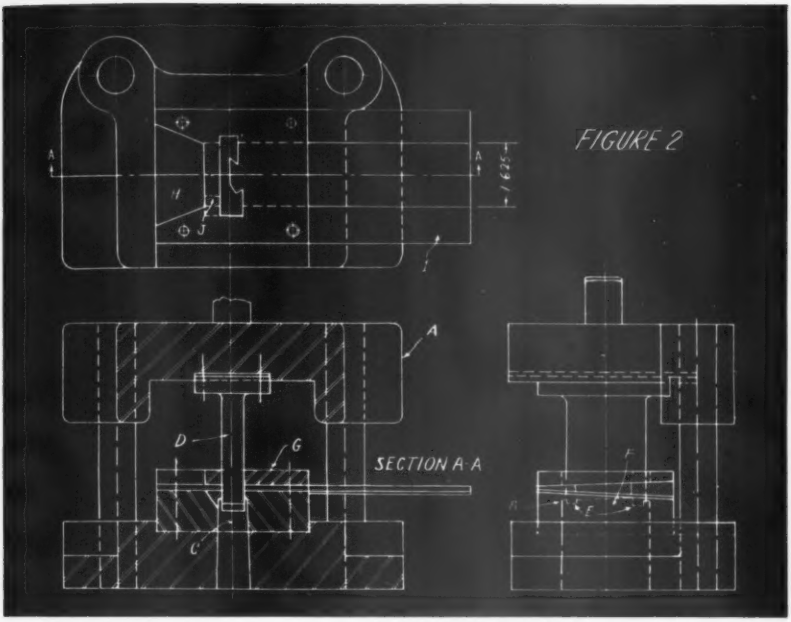
by Alex S. Arnott

The problem of cutting copper segments accurately in large quantities for electrical motor armatures is easily solved by machining copper bars to size and stamping them out to the shape or form required with a special blanking die. Stamping is a great improvement on the old production method of milling the segment forms out of bar stock on a milling machine setup where less accuracy is obtained due to wear and other variations of the milling cutters.

The first operation is to mill long copper bars to 1.625" wide, and the second operation is to mill the whole length of the bar to an angle of 2° on each side of the bar to make it to the angle shown in Figure 1.

The third operation is to stamp out the outline by using the die shown in Figure 2. The die is made up of a standard die set (A) which is machined to accommodate all the die parts. The die (B) is made from tool steel, profiled to the dimensions of the segment to a depth of ¼" and then relieved at (C) at an angle sufficient to allow the parts to drop clear of the die as they are being blanked out. The face of the die is cut at an angle of 2° to conform to the lower surface of the machined bar stock as it is fed thru the die during the operation. The length of the die opening is made ½" longer than the width of the bar material to take care of the heels of the punch. An undercut is machined across the base as shown in the section A-A, and the length of the die is fitted into it, being held there with two cap screws and dowels, to keep the





die opening properly centered with the center lines of the base.

The punch (D) is made of one piece of oil hardened steel and is shaped to fit into the outline of the die. The blanking end of the punch is shaped with heels (E) at each side, and is undercut at (F) to an angle of 2° to make the end of the punch parallel to the upper surface of the machined bar stock. The upper end of the punch is fitted into an undercut in the top of the die set and held there with screws and dowels that align the punch with the die opening. The length of the punch is made so that it will pass through the die and have an extra ¼" to spare.

To strip the scrap stock from the punch, a stripper plate (G) is mounted on two strips of steel to raise it above the die face so that the stock may pass between the die and the stripper. An opening is made so that the punch may pass through it with plenty of clearance. At opening (H) the scrap material is removed from the die as the segments are blanked out. At the other end of the stripper a material guide (I) is fastened, its purpose being to guide the copper bars into the opening between the die and the stripper. The guide, like the stripper plate, is machined at an angle to conform to the copper bars as they pass through the die. The end view of Figure 2 shows the construction of these parts and the position they take in the assembly.

In operation, the bars are placed on the guide and moved along, passing under the stripper until the end of the bar reaches the stop (J). The punch is then brought down to blank the material through the die. Ordinarily, blanking punches only penetrate 20% into the die to shear the stock, but in this case the material is so thick that it was deemed advisable to drive the punch ⅛" beyond the die to assure that the blanks would be pushed out of the die and not jam in the opening. The heels on the punch also play an important part by coming within the die opening before the shearing of the material takes place, thereby laterally supporting and guiding the punch for its heavy shear. The angular opening between the stripper plate and the face of the die makes the loading of the work into the guide "foolproof".

DESIGN OF A TURRET HEAD FOR A STANDARD LATHE

by Lee Brady

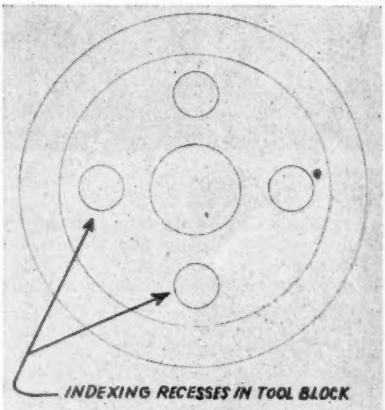
By the use of a simple and inexpensive method it is possible to make a four place turret head to fit the average standard lathe. With a standard lathe so equipped the operator is often able to perform the same class of work for which the more expensive turret lathe is ordinarily used.

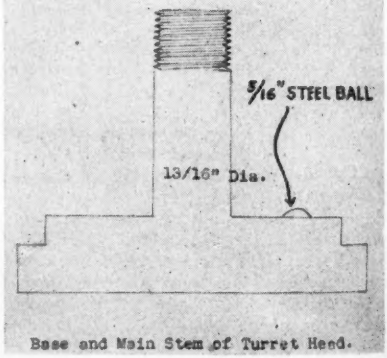
The work is started first by selecting a flat piece of steel of the proper size to fit into the toolpost T-slot of the lathe compound. A standard ½" bolt is welded to this flat for the purpose of locking the completed head assembly to the compound. The base and stem are turned from one piece. A hole is bored in the exact center to fit over the upright ½" bolt extending from the T-slot. On one side of the base, midway between the center and the extreme end, a two-step, blind hole is bored, as shown, to allow the insertion of the indexing element. The complete indexing element consists of a ⅝" steel ball positioned on top of a ⅛" x ½" coil spring in such a manner as to engage the indexing recesses of the tool block.

Insert a sharp pointed, close fitting scriber pin into the index hole and rotate the tool block slowly by hand in order to scribe a line around the bottom of the block. Along the line mark off and drill four recesses large enough to permit the ⅝" steel ball of the indexing element to fall easily into place (but appreciably less than half the ball diameter) when the tool block is rotated. Care must be taken to have the four recesses 90° from each other. The block should be divided into four equal sections with the recesses in the exact center of each section.

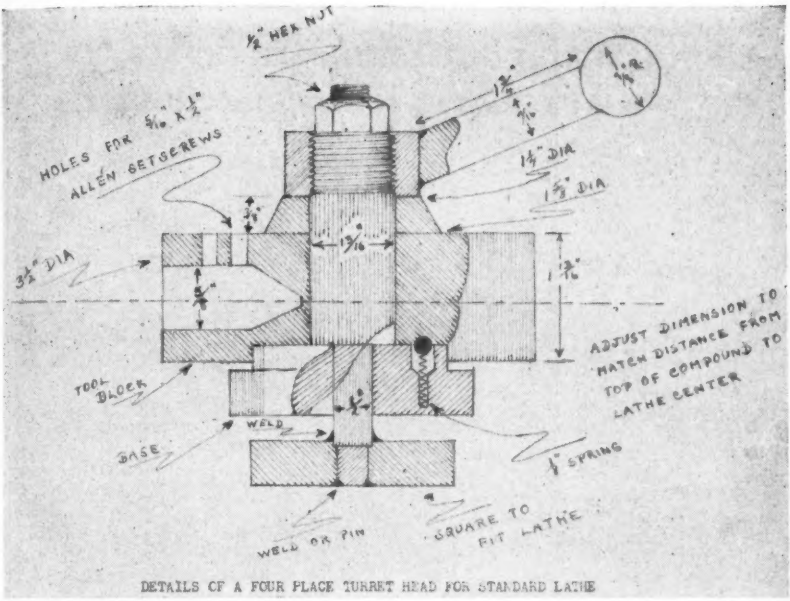
Next, a collar 1¼" in diameter is made and threaded inside and placed on top of the tool block. To this collar a handle of the dimensions shown in the drawing is welded for the purpose of rotating the turret head when necessary. A ½" hex nut is mounted on top of the collar for the purpose of locking the entire head assembly together.

The tool block is again divided into four equal divisions so that the holes to be used as tool holders are equi-distant (90°) from each other, as well as equi-distant from the exact center of the





Base and Main Stem of Turret Head.



DETAILS OF A FOUR PLACE TURRET HEAD FOR STANDARD LATHE

turret head itself. The tool holes are drilled ⅝" diameter for the use of standard turret head accessory tools. Small holes are bored for Allen set screws for securing the accessory tools in the tool holder. Tools with smaller shanks may be used if desired simply by using Morse taper shank adapters or the proper size reducing bushings.

The tool holes should be spotted from the headstock spindle with a center drill so that the center of the headstock spindle and the turret bores will be of the same height or in line with each other. The four tool holes must be drilled with the turret head fitted into the T-slot of the lathe compound on which the turret head is to be used in order to obtain the proper position of the tool holes.

A careful study of the detailed drawing will enable any machinist to complete a four place turret head without difficulty. Such a turret head will make internal boring or threading a simple matter on a standard lathe. It likewise will prove to be very useful for drilling or reaming jobs from the lathe carriage where a power feed is desirable.

Holiday War Work Will Save Soldiers' Lives

WPB Chairman J. A. Krug, in a recent statement, called on American labor and industry to observe full work schedules in all war plants during the Christmas week-end, with the single exception of Christmas day.

"Because of its profound religious significance, Christmas day is the one holiday of the year which we should observe as a holiday," said Krug. "However, our war production schedules are so urgent that we cannot afford the luxury of a shutdown over the entire Christmas week-end. In addition, work should be carried on on Christmas day itself in plants where continuous operation is necessary, such as blast furnaces and open hearth furnaces producing carbon steel. Full production schedules should be observed in all war plants on New Year's Day."

CARBIDE MACHINING OF STEELS ON AUTOMATIC SCREW MACHINES

by Carl W. Blade*

Experience has shown that in applying carbide tipped tools to automatic screw machine operations on various grades of carbon and alloy steels, excellent results both as to greatly stepped-up production and lowered machining costs and tool life can be obtained by adhering to certain basic rules.

Speeds and Feeds

For most efficient operation when using cemented carbide tipped tools in automatic screw machines for steel cutting, cutting speeds must be higher than when HSS tools are employed for identical operations. Too low a cutting speed will shorten tool life and give a dull, ragged finish to the work. Maintaining proper high cutting speed will produce a bright, smooth finish and will also increase tool life.

For turning, boring, and facing with ordinary single point tools on various steels, choice of cutting speed depends mainly on depth of cut, feed, and hardness of the steel. The usual range of speeds is from 200 to 350 SFPM.

Where the character of operations necessitates the use of some HSS tools, speeds of the spindles equipped with these tools must necessarily be slower than those called for by carbide tools. If these speeds govern the speed of turning, facing, boring, etc., as well, such speeds will sometimes be too low for the effective use of carbide tools.

Too fine a feed on rough turning operations increases wear of the tool tip and aggravates chip disposal since such chips tend to "ride" the breaker. Heavier feeds give stiffer chips which break more rapidly and can be handled more easily. Where fine feeds are necessary, a grade of Carboloy which has a high degree of wear resistance is recommended.

Form tools require finer feeds to prevent chatter. Feeds from .0025" to .005" per rev. are common, but on some steels feeds up to .010" are possible. A harder grade of carbide is generally used for form tools to resist the abrasive action caused by the fine feeds. In certain instances, a "straight tungsten" grade of carbide will give optimum results with fine feeds.

As with other types of machines, choice of feeds depends upon the type of tool used, rigidity of the work, and the nature of the work material. Feeds of .010" to .020" per rev. are commonly used on operations employing ordinary single point tools or roller turner type tools.

Horsepower

Higher horsepower may be required when retooling an automatic screw machine with carbides, due to the increased speeds and greater number of cubic inches of metal removed per minute. To utilize *existing* equipment, the feed can be reduced and a harder grade of carbide used; depth of cut can be reduced; or the speed can be cut to the minimum of the carbide tool range. The fewer of these variables which have to be changed, the better. Usually, reconditioning of

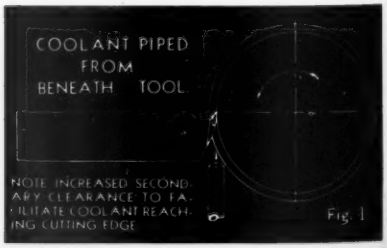


Fig. 1

*Sales Engineer, Carboloy Co., Inc.

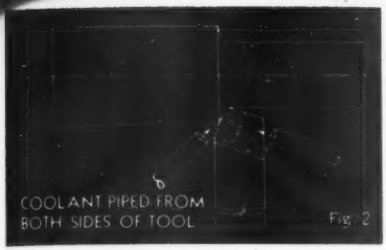


Fig. 2

bearings in spindles and carrier, etc., will permit the machine to be re-motored for higher output operations with cemented carbide tipped tools.

Roughing Cuts

Uneven speeds and sudden accelerations during heavy roughing cuts sometimes chip carbide tools. Peak loads responsible for such a condition can often be eliminated by splitting the roughing cut and picking up at another position. In this way, slowing down and quick pick-up of the motor is avoided.

Cut-Off Tools

A cutting-off tool, feeding from the OD in toward dead center, may *start* cutting at the proper speed, but *loses* cutting speed rapidly as it approaches center. On work pieces having holes drilled in them so the tool doesn't have to cut to dead center, and also on certain operations where such extremely high speeds are possible that a carbide cut-off tool can successfully be run in to dead center, little trouble is experienced with carbides. Frequently, however, when such an operation is performed in the conventional manner on a solid steel part wth a carbide tool, a built-up edge may be formed on the edge of the tool causing pressure, dulling, and flaking of the tip's cutting edge.

In some cases where it is desired to base cutting speeds on carbide rather than on HSS tools, a Carboloy cut-off tool can be used to *start* the cut and a HSS tool to *complete* the cut. This technique is predicated, of course, on there being a position available on the machine.

Weight and length of piece being cut off must also be given consideration as the "whip" and "drop" may tend to cramp a tool and break its tip. If the piece being cut off has a hole, and if a position is available, a horn or arm can be fed into the hole to prevent whip and drop. A knock-off must be provided on return of turret or carrier spindle. If the workpiece has no hole, a Vee guide or a hole larger than the workpiece can be fed under or over the overhanging piece to steady it and prevent cramping.

Rake Angle

For most types of steels cut by screw machine tools, the rake angle in the direction of the feed should be between 4° and 8° on the chip breaker surface to maintain maximum cutting edge strength and also to obtain free cutting action and good finish. Rake angles up to 10° and 15° on the chip breaker surface may be necessary for certain low carbon, nickel alloy, stainless, Nitralloy, and high speed steels where chips are sluggish or gummy.

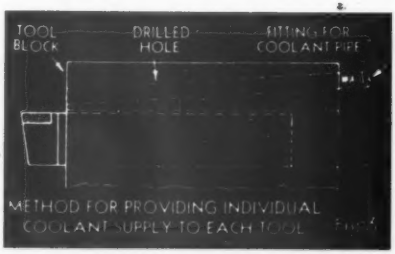
Tool Grinding

Properly ground chip breakers on carbide tools control the dangerous "ribbon" chips which tend to tangle around the tool, tool block, and workpiece, by breaking the chip into "crescents" or by producing a "continuous coil". Chip curlers should be ground at an angle which will deflect the chip and cause it to clear the tool holder or block. A chip breaker should be ground at an angle to the side cutting edge to deflect the chip against the upturned shoulder of the work and break it into a "crescent".

Coolant

The higher cutting speeds available with carbides makes *cooling quality* a prime requisite of the cutting fluid. Straight cutting oils are not usually recommended mainly because they tend to *temper*—rather than *quench*—the hot metal chip, making the chip springy and difficult to control. "Soft soap" base solubles help prevent rust in addition to

(TO PAGE 126—PLEASE)



METHOD FOR PROVIDING INDIVIDUAL COOLANT SUPPLY TO EACH TOOL Fig. 4

MEEHANITE TOOL CASTINGS

A great increase has been experienced in the use of Meehanite cast metal as the base for carbide tipped cutting tools. A brief history regarding this application may be of general interest to those in the machine tool and metal working field.

During the early period of World War II The Cooper-Bessemer Corporation found it impossible to obtain steels commonly used for this purpose because of the extremely heavy demands on steel for applications covered by the highest priorities. The manufacturers of steel were asked to, and did perform a Herculean task, but their capacities were sorely over-taxed and they could not produce all the steel necessary for the war effort in the limited time in which they had to do it. It was important that something be done. As manufacturers and licensees of Meehanite metal in the heavy machinery field, Cooper-Bessemer realized the possibility of using it as a substitute for steel for tool shanks. After exhaustive experimentation and tests a suitable grade of Meehanite was developed and used for the conventional single purpose cutting tool shank tipped with carbide. However, it was not until these tool shanks had been put into actual use that the full merit of this application of Meehanite was appreciated and a study of the comparative analysis outlined below will reveal the excellent physical characteristics of Meehanite for this purpose.

Among the important advantages of Meehanite over steel for this application are:

A. Casting to shape, requiring less time and machining to complete tools.

B. Greater damping capacity, eliminating tool chatter.

C. Easier machining of tool, consuming only one-half the time and power.

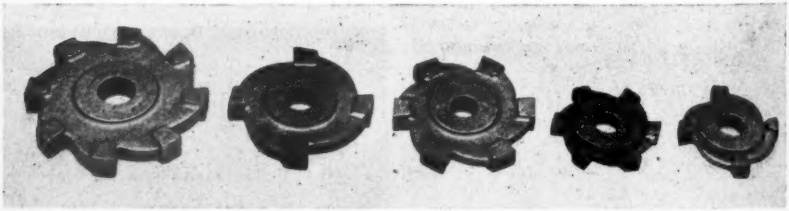
D. A coefficient of expansion nearer to that of tungsten carbide than that of steel, thus eliminating checked carbide tips when affixing due to unequal expansion.

E. Not loading up grinding wheel as rapidly with resulting grinding economy.

F. Ability to dissipate heat at a faster rate, assuring cooler operation and longer tip life.

The correctness of this Meehanite application was attested to by the fact that the first year it was made available to the trade, over 800 tons were used for single purpose tool shanks alone by several hundred manufacturers working on war contracts. It was the means through which many kept their production on schedule.

Because of the success attained by the use of Meehanite tool shanks, it was quite natural that thought was directed toward applying Meehanite to other cutting tools such as forming tools and milling cutter bodies. The reception given these tools by users is even greater than that given single purpose tool shanks. High speed milling has become an established fact. At the present time the speed at which metal can be removed



Milling cutter bodies of cast Meehanite metal, typical of the types and sizes being produced by Cooper-Bessemer.

COMPARISON BETWEEN MEEHANITE AND OTHER METALS

Material	Forged Steel	Cast Steel	Gray Iron	Meehanite
Specific Gravity	7.9	7.6	7.0	7.48
Tensile Strength P.S.I.	72,000	65,000	30,000	50,000
Damping Capacity at Torsional 15,000 P.S.I.	7.0	8.5	14.0	14.0
Compressive Strength P.S.I.	100,000	95,000	150,000	175,000
Machinability (Dalcher) Cutting Tool Pressure Exerted in Lbs.	70	64	41	38
Machinability (By test)* Pounds Removed Hours Required	170 23	170 19.5	170 13.83	170 10.53

*Test conducted using high speed steel for cutting. In each case the length of time would have been much less had tungsten carbide been used.

is limited only by the capacity of existing milling machine design. Much will be done in the very near future to improve milling machines so that higher cutting speeds and power will be available. The economy of Meehanite bodies, carbide tipped, will play an important part in this development.

Where tungsten carbide cannot be used as the cutting medium, other high-grade cutting steel in the Stellite class may be affixed to Meehanite bodies in the same manner.

In connection with the method recommended for attaching cutting tips to Meehanite bodies, the following generally accepted practice has been found to produce the best obtainable results:

1. Mill the necessary recesses to suit the type of tip.

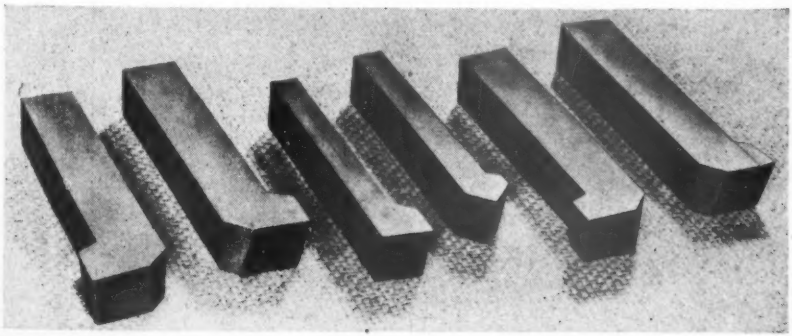
2. It is essential that all surfaces to be joined are thoroughly cleaned. This is accomplished by using carbon tetrachloride in the recesses and on the tips.

3. Cut piece of silver solder, such as "Easy-Flo No. 3", to conform to the sides and bottom of carbide tip.

4. Apply a liberal amount of flux, such as "Handy Flux", in the recess. Place the silver solder in the recess and cover with flux; then, after grinding tip on the side and edge where it is to be brazed to the tool, lay carbide tip in place.

5. Heat bottom of tool directly underneath the recess, keeping the flame of the torch ¼" to ½" away from the work. Gradually apply heat to the sides as well as to the joint and tip until the solder is molten and flows freely, wetting the

(TO PAGE 126—PLEASE)



Cast Meehanite tool shanks such as these, cast at Cooper-Bessemer, are replacing shanks of critical steel.

MATERIALS[1] WEIGHT[2] TABLES (T & D J Condensed Arrangement) — PART VIII[3]

Calculated and Compiled by Geo. H. Thompson

	2 5/16" x	2 3/8" x	2 7/16" x	2 1/2" x	2 9/16" x	2 5/8" x
1"	655.83	673.55	691.28	709.00	726.73	744.45
2"	1311.65	1347.10	1382.55	1418.00	1453.45	1488.90
3"	1967.48	2020.65	2073.83	2127.00	2180.18	2233.35
4"	2623.30	2694.20	2765.10	2836.00	2906.90	2977.80
5"	3279.13	3367.75	3456.38	3545.00	3633.63	3722.25
6"	3934.95	4041.30	4147.65	4254.00	4360.35	4466.70
7"	4590.78	4714.85	4838.93	4963.00	5087.08	5211.15
8"	5246.60	5388.40	5530.20	5672.00	5813.80	5955.60
9"	5902.43	6061.95	6221.48	6381.00	6540.53	6700.05
10"	6558.25	6735.50	6912.75	7090.00	7267.25	7444.50
11"	7214.08	7409.05	7604.03	7799.00	7993.98	8188.95
12"	7869.90	8082.60	8295.30	8508.00	8720.70	8933.40
1/16"	40.99	42.10	43.20	44.31	45.42	46.53
1/8"	81.98	84.19	86.41	88.63	90.85	93.06
3/16"	122.97	126.29	129.62	132.94	136.27	139.58
1/4"	163.96	168.39	172.82	177.25	181.68	186.11
5/16"	204.95	210.48	216.02	221.56	227.10	232.64
3/8"	245.94	252.58	259.23	265.88	272.52	279.17
7/16"	286.92	294.68	302.43	310.19	317.94	325.70
1/2"	327.91	336.78	345.64	354.50	363.36	372.23
9/16"	368.90	378.87	388.84	398.81	408.78	418.75
5/8"	409.89	420.97	432.05	443.13	454.20	465.28
11/16"	450.88	463.07	475.25	487.44	499.62	511.81
3/4"	491.87	505.16	518.46	531.75	545.04	558.34
13/16"	532.86	547.26	561.66	576.06	590.46	604.87
7/8"	573.85	589.36	604.87	620.38	635.88	651.39
15/16"	614.84	631.45	648.07	664.69	681.31	697.92

[1]Based on a steel of 1 cu. in.=.2836 lb.

[2]Multiply constant by stock thickness in thousandths of an inch to get weight in pounds per thousand pieces

[3]Part I, Tool & Die Journal, May, 1944
Part II, Tool & Die Journal, June, 1944
Part III, Tool & Die Journal, July, 1944
Part IV, Tool & Die Journal, August, 1944
Part V, Tool & Die Journal, September, 1944
Part VI, Tool & Die Journal, October, 1944
Part VII, Tool & Die Journal, November, 1944

MATERIALS[1] WEIGHT[2] TABLES (T & D J Condensed Arrangement)

MATERIALS[1] WEIGHT[2] TABLES (T & D J Condensed Arrangement)

Calculated and Compiled by Geo. H. Thompson

2 1/16" x		2 3/4" x		2 13/16" x		2 7/8" x		2 15/16" x		3" x	
1"	762.18	1"	779.90	1"	797.63	1"	815.35	1"	833.08	1"	850.80
2"	1524.35	2"	1559.80	2"	1595.25	2"	1630.70	2"	1666.15	2"	1701.60
3"	2286.53	3"	2339.70	3"	2392.88	3"	2446.05	3"	2499.23	3"	2552.40
4"	3048.70	4"	3119.60	4"	3190.50	4"	3261.40	4"	3332.30	4"	3403.20
5"	3810.88	5"	3899.50	5"	3988.13	5"	4076.75	5"	4165.38	5"	4254.00
6"	4573.05	6"	4679.40	6"	4785.75	6"	4892.10	6"	4998.45	6"	5104.80
7"	5335.23	7"	5459.30	7"	5583.38	7"	5707.45	7"	5831.53	7"	5955.60
8"	6097.40	8"	6239.20	8"	6381.00	8"	6522.80	8"	6664.60	8"	6806.40
9"	6859.58	9"	7019.10	9"	7178.63	9"	7338.15	9"	7497.68	9"	7657.20
10"	7621.75	10"	7799.00	10"	7976.25	10"	8153.50	10"	8330.75	10"	8508.00
11"	8383.93	11"	8578.90	11"	8773.88	11"	8968.85	11"	9163.83	11"	9358.80
12"	9146.10	12"	9358.80	12"	9571.50	12"	9784.20	12"	9996.90	12"	10209.60
1/16"	47.64	1/16"	48.74	1/16"	49.85	1/16"	50.96	1/16"	52.07	1/16"	53.18
1/8"	95.28	1/8"	97.49	1/8"	99.71	1/8"	101.92	1/8"	104.14	1/8"	106.35
3/16"	142.91	3/16"	146.23	3/16"	149.55	3/16"	152.88	3/16"	156.20	3/16"	159.53
1/4"	190.54	1/4"	194.98	1/4"	199.41	1/4"	203.84	1/4"	208.27	1/4"	212.70
5/16"	238.18	5/16"	243.72	5/16"	249.26	5/16"	254.80	5/16"	260.34	5/16"	265.88
3/8"	285.82	3/8"	292.46	3/8"	299.11	3/8"	305.76	3/8"	312.40	3/8"	319.05
7/16"	333.45	7/16"	341.21	7/16"	348.96	7/16"	356.72	7/16"	364.47	7/16"	372.23
1/2"	381.09	1/2"	389.95	1/2"	398.81	1/2"	407.68	1/2"	416.54	1/2"	425.40
9/16"	428.72	9/16"	438.69	9/16"	448.66	9/16"	458.63	9/16"	468.60	9/16"	478.58
5/8"	476.36	5/8"	487.44	5/8"	498.52	5/8"	509.59	5/8"	520.67	5/8"	531.75
11/16"	524.00	11/16"	536.18	11/16"	548.37	11/16"	560.55	11/16"	572.74	11/16"	584.93
3/4"	571.63	3/4"	584.93	3/4"	598.22	3/4"	611.51	3/4"	624.81	3/4"	638.10
13/16"	619.27	13/16"	633.67	13/16"	648.07	13/16"	662.47	13/16"	676.87	13/16"	691.28
7/8"	666.90	7/8"	682.42	7/8"	697.92	7/8"	713.43	7/8"	728.94	7/8"	744.45
15/16"	714.54	15/16"	731.16	15/16"	747.77	15/16"	764.39	15/16"	781.01	15/16"	797.63

[1]Based on a steel of 1 cu. in.=.2836 lb.

[2]Multiply constant by stock thickness in thousandths of an inch to get weight in pounds per thousand pieces

MATERIALS[1] WEIGHT[2] TABLES (T & D J Condensed Arrangement)

Calculated and Compiled by Geo. H. Thompson

	3 1/16" x		3 1/8" x		3 3/16" x		3 1/4" x		3 5/16" x		3 3/8" x
1"	868.53	1"	886.25	1"	903.98	1"	921.70	1"	939.43	1"	957.15
2"	1737.05	2"	1772.50	2"	1807.95	2"	1843.40	2"	1878.85	2"	1914.30
3"	2605.58	3"	2658.75	3"	2711.93	3"	2765.10	3"	2818.28	3"	2871.45
4"	3474.10	4"	3545.00	4"	3615.90	4"	3686.80	4"	3757.70	4"	3828.60
5"	4342.63	5"	4431.25	5"	4519.88	5"	4608.50	5"	4697.13	5"	4785.75
6"	5211.15	6"	5317.50	6"	5423.85	6"	5530.20	6"	5636.55	6"	5742.90
7"	6079.68	7"	6203.75	7"	6327.83	7"	6451.90	7"	6575.98	7"	6700.05
8"	6948.20	8"	7090.00	8"	7231.80	8"	7373.60	8"	7515.40	8"	7657.20
9"	7816.73	9"	7976.25	9"	8135.78	9"	8295.30	9"	8454.83	9"	8614.35
10"	8685.25	10"	8862.50	10"	9039.75	10"	9217.00	10"	9394.25	10"	9571.50
11"	9553.78	11"	9748.75	11"	9943.73	11"	10138.70	11"	10333.70	11"	10528.70
12"	10422.30	12"	10635.00	12"	10847.70	12"	11060.40	12"	11273.10	12"	11485.80
1/16"	54.29	1/16"	55.40	1/16"	56.50	1/16"	57.61	1/16"	58.72	1/16"	59.83
1/8"	108.57	1/8"	110.78	1/8"	113.00	1/8"	115.21	1/8"	117.43	1/8"	119.64
3/16"	162.85	3/16"	166.18	3/16"	169.50	3/16"	172.82	3/16"	176.15	3/16"	179.47
1/4"	217.13	1/4"	221.56	1/4"	225.99	1/4"	230.43	1/4"	234.86	1/4"	239.29
5/16"	271.41	5/16"	276.95	5/16"	282.49	5/16"	288.03	5/16"	293.57	5/16"	299.11
3/8"	325.70	3/8"	332.34	3/8"	338.99	3/8"	345.64	3/8"	352.29	3/8"	358.93
7/16"	379.98	7/16"	387.73	7/16"	395.49	7/16"	403.24	7/16"	411.00	7/16"	418.75
1/2"	434.26	1/2"	443.13	1/2"	451.99	1/2"	460.55	1/2"	469.71	1/2"	478.58
9/16"	488.55	9/16"	498.52	9/16"	508.49	9/16"	518.46	9/16"	528.43	9/16"	538.40
5/8"	542.83	5/8"	553.91	5/8"	564.98	5/8"	576.06	5/8"	587.14	5/8"	598.22
11/16"	597.11	11/16"	609.30	11/16"	621.48	11/16"	633.67	11/16"	645.85	11/16"	658.04
3/4"	651.39	3/4"	664.69	3/4"	677.98	3/4"	691.28	3/4"	704.57	3/4"	717.86
13/16"	705.68	13/16"	720.08	13/16"	734.48	13/16"	748.88	13/16"	763.28	13/16"	777.68
7/8"	759.96	7/8"	775.47	7/8"	790.98	7/8"	806.49	7/8"	822.00	7/8"	837.51
15/16"	814.24	15/16"	830.86	15/16"	847.48	15/16"	864.09	15/16"	880.71	15/16"	897.33

[1]Based on a steel of 1 cu. in.=.2836 lb.

[2]Multiply constant by stock thickness in thousandths of an inch to get weight in pounds per thousand pieces

MATERIALS[1] WEIGHT[2] TABLES (T & D J Condensed Arrangement)

[2]Multiply constant by stock thickness in thousandths of an inch to get weight in pounds per thousand pieces

MATERIALS[1] WEIGHT[2] TABLES (T & D J Condensed Arrangement)

Calculated and Compiled by Geo. H. Thompson

	3 7/16" x		3 1/2" x		3 9/16" x		3 5/8" x		3 11/16" x		3 3/4" x
1"	974.88	1"	992.60	1"	1010.33	1"	1028.05	1"	1045.78	1"	1063.50
2"	1949.75	2"	1985.20	2"	2020.65	2"	2056.10	2"	2091.55	2"	2127.00
3"	2924.63	3"	2977.80	3"	3030.98	3"	3084.15	3"	3137.33	3"	3190.50
4"	3899.50	4"	3970.40	4"	4041.30	4"	4112.20	4"	4183.10	4"	4254.00
5"	4874.38	5"	4963.00	5"	5051.63	5"	5140.25	5"	5228.88	5"	5317.50
6"	5849.25	6"	5955.60	6"	6061.95	6"	6168.30	6"	6274.65	6"	6381.00
7"	6824.13	7"	6948.20	7"	7072.28	7"	7196.35	7"	7320.43	7"	7444.50
8"	7799.00	8"	7940.80	8"	8082.60	8"	8224.40	8"	8366.20	8"	8508.00
9"	8773.88	9"	8933.40	9"	9092.93	9"	9252.45	9"	9411.98	9"	9571.50
10"	9748.75	10"	9926.00	10"	10103.30	10"	10280.50	10"	10457.80	10"	10635.00
11"	10723.60	11"	10918.60	11"	11113.60	11"	11308.60	11"	11503.50	11"	11698.50
12"	11698.50	12"	11911.20	12"	12123.90	12"	12336.60	12"	12549.30	12"	12762.00
1/16"	60.93	1/16"	62.04	1/16"	63.15	1/16"	64.26	1/16"	65.37	1/16"	66.47
1/8"	121.86	1/8"	124.08	1/8"	126.30	1/8"	128.51	1/8"	130.73	1/8"	132.94
3/16"	182.79	3/16"	186.11	3/16"	189.44	3/16"	192.76	3/16"	196.09	3/16"	199.41
1/4"	243.72	1/4"	248.15	1/4"	252.58	1/4"	257.01	1/4"	261.44	1/4"	265.88
5/16"	304.65	5/16"	310.19	5/16"	315.73	5/16"	321.27	5/16"	326.81	5/16"	332.34
3/8"	365.58	3/8"	372.23	3/8"	378.87	3/8"	385.52	3/8"	392.17	3/8"	398.81
7/16"	426.51	7/16"	434.26	7/16"	442.02	7/16"	449.77	7/16"	457.53	7/16"	465.28
1/2"	487.44	1/2"	496.30	1/2"	505.16	1/2"	514.03	1/2"	522.89	1/2"	531.75
9/16"	548.37	9/16"	558.34	9/16"	568.31	9/16"	578.28	9/16"	588.25	9/16"	598.22
5/8"	609.30	5/8"	620.38	5/8"	631.45	5/8"	642.53	5/8"	653.61	5/8"	664.69
11/16"	670.23	11/16"	682.42	11/16"	694.60	11/16"	706.78	11/16"	718.97	11/16"	731.16
3/4"	731.16	3/4"	744.45	3/4"	757.74	3/4"	771.04	3/4"	784.33	3/4"	797.63
13/16"	792.09	13/16"	806.49	13/16"	820.89	13/16"	835.29	13/16"	849.69	13/16"	864.09
7/8"	853.02	7/8"	868.53	7/8"	884.03	7/8"	899.54	7/8"	915.05	7/8"	930.56
15/16"	913.95	15/16"	930.56	15/16"	947.18	15/16"	963.80	15/16"	980.42	15/16"	997.04

[1]Based on a steel of 1 cu. in.=.2836 lb.

[2]Multiply constant by stock thickness in thousandths of an inch to get weight in pounds per thousand pieces

Procedures in Plastics

DESIGN OF MOLDED PLASTICS PARTS

CONTOUR DESIGN - PART 4

By Warren V. Prince

HOLES AND UNDERCUTS

Cored Side Holes

Holes can be very conveniently molded into plastics parts under certain conditions. Other conditions make it much more practical to drill or machine the holes after molding. The molding limitations and conditions must be carefully considered before the molded part is designed, and especially before the mold is built so as not to run into trouble in production or in service.

When a side hole is to be molded into a plastics part by compression molding, the core for the hole projects sideways into the cavity of the mold. When the hard molding material as a powder or preform is placed into the cavity, some of the material will rest on the top of the core pins. When the mold is closed upon this material, the extreme forces pack the material down against the core pins and bend them down or break them off. Therefore, core pins should never extend into the cavity sideways for a distance greater than twice the diameter of the pin. If the part can be molded on its side so that the pins are vertical, the danger of breakage is greatly lessened. Core pins can be made longer if supported at both ends, such as by passing completely through the cavity and into the opposite wall for support, or if the free ends are supported on vertical pins or a portion of the mold directly beneath the free end.

The same limitations apply to inserts to be molded into a plastics part. In the case of threaded inserts where the insert rests on a pin projecting into the cavity, the outside of the insert presents a much greater area to the molding pressure than the slender pin can usually withstand.

In straight compression molding long core pins or inserts are practical only when located in the vertical direction so that the closing forces are applied to the end of the pins. If vertical pins are too slender in proportion to their length, they will not withstand side movement of the molding material during closing of the mold under pressure. Study the shape of the mold cavity and plunger to predetermine what this flow might amount to and in what direction.

Inserts placed on the bottom of a cavity can be easily dislodged by side flow of material if they are not firmly held in place. Side flow occurs particularly in cup-shaped parts where the closing of the mold forces material out of the bottom and up into the sides. Thus, there is a decided side-flow radially from the center of the bottom during closing.

The ends of core pins that form the bottom of the holes in molded pieces

should be rounded or chamfered if possible to allow better flow of material around the pins and to prevent cracking at the sharp corners after removal from the mold.

Electronic Heating for Cored Holes

Pin breakage in straight compression molding can often be eliminated by first softening the molding material by means of electronic or high frequency heating prior to molding. In order to do this, the material must be preformed and a high frequency heating unit must be available at the press. Material molded in this manner is already softened to about the consistency of molder's clay and flows much more readily under molding pressures.

If the core pins or inserts are extremely slender, even this method will fail to prevent bending or breakage of the pins. High frequency is limited to thermosetting materials at the present because the thermoplastic materials cannot be readily preformed. Preforming is necessary to drive out all air spaces from the material before it can be electronically heated with uniformity. High frequency heating improves other molding characteristics as well as easy flow.

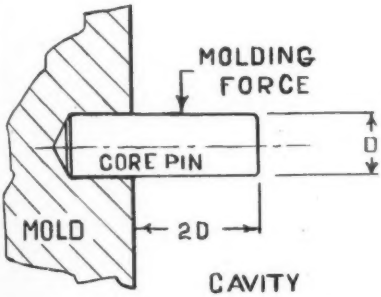


Fig. 20 — In compression molding the material in preform or powder form is forced down and packed against the pin as the mold closes before the material has an opportunity to soften. If the pin is too long (twice the diameter is the maximum length recommended), the result is pin breakage.

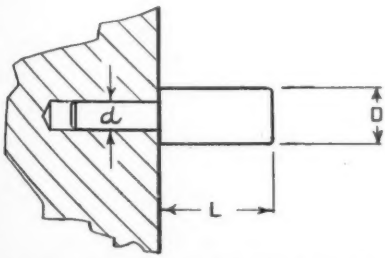


Fig. 21—In designing the length of this core, its small diameter "d" and the area exposed to the molding force must be considered. This is much greater in comparison than in Fig. 20.

Transfer and Injection for Cored Holes

The best solution for molding around long slender core pins is to change over to transfer molding or injection molding.

The reasons are as follows:

1. The molding material enters the cavity in the *softened* condition.

2. The molding material enters the cavity progressively through a small orifice, thus preventing sudden pressure on pins.

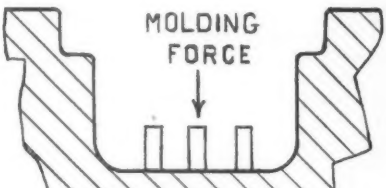


Fig. 22—Core pins or inserts mounted in the direction of the compression molding force can withstand much greater forces.

3. High pressure cannot be developed in the cavity until filling is completed and the final pressure is developed in *all directions* at once (similar to hydraulic pressure) rather than all the pressure on one side of the pins.

One limitation with transfer or injection is that the force of the thin stream

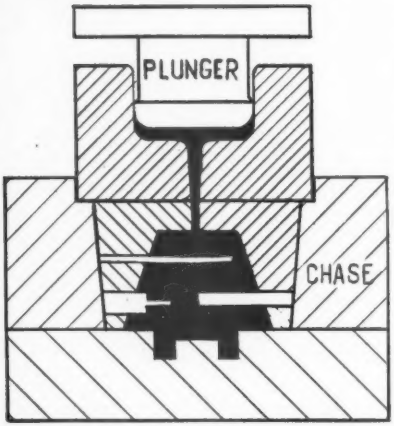


Fig. 23—Long, slender core pins or inserts can be used in transfer or injection molding because the material enters the cavity in a softened condition and as a thin stream. The transfer mold shown has a 5° taper on the side.

of semi-stiff material entering the cavity may be too much for the delicate pins to withstand. This condition is not frequently encountered. In this case, smaller gates, high frequency heating, and soft flow materials will improve conditions.

Drilling

Rather than to take a chance on long slender core pins and the problems of pin breakage, it is much better to drill the holes after molding wherever it is practical. This is done as a part of the finishing operations. High carbon drills are usually best because they withstand greater heat during drilling. The heat developed from drilling accumulates in the drill because plastics materials are such poor conductors of heat they do not conduct the heat away from the drill point as well as metals.

Special drills for thermosetting materials are used in many instances for high production runs. For sections up to $\frac{1}{16}$" thickness, a drill with a 60° included angle point is used with a 15° lip clearance and a slow helix. The flutes are thin and highly polished to remove chips freely. For thickness greater than $\frac{1}{16}$", a 90° included angle is usually best. Speeds of 200 to 300 fpm at the outer diameter of the drill are usually used. Thermoplastic materials require slower speeds to avoid burning or gumming and soap can be used as a lubricant for holes over $\frac{1}{8}$". If trouble occurs, back the drill out of the hole occasionally during drilling. Keep the drill in the plastics part for the shortest possible length of time to avoid overheating. (Also see "Drilling and Tapping Plastics Materials." Pages 99-101, May issue.)

Taper or Draft on Cores

Cored holes should always have taper or draft if at all possible. Straight holes often cause difficulty in withdrawal of the core. Sometimes scoring results and even distortion of the molded piece. Distortion can be largely prevented by withdrawing the core *before* the mold is opened so that the entire contour of the piece is supported by the cavity walls during withdrawal.

Where a slight taper is used on a core, it is easy to make the mistake in the tool room of making the taper the wrong way, or to assemble the core the wrong way with the taper reversed during as-

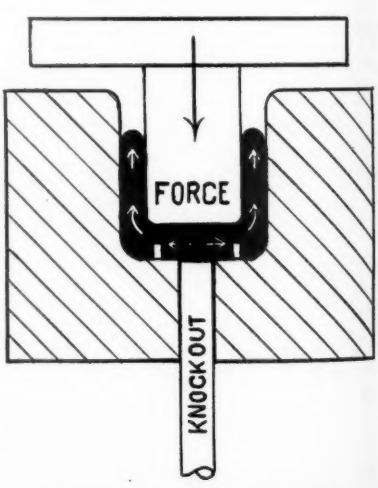


Fig. 24—A compression mold in closing forces the material to flow outward, past core pins and upward.

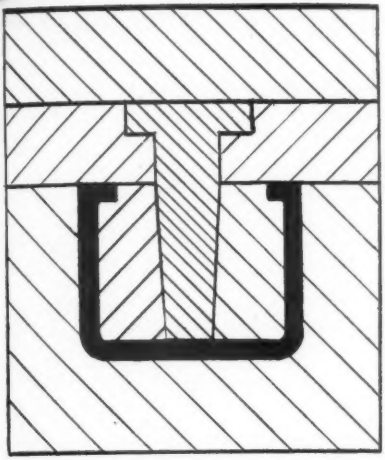


Fig. 25—Collapsible core for molding inserts. The wedge-shaped piece (3° taper on side) pulls out allowing two side pieces to collapse toward the center and be pulled out through the neck of the molded piece.

sembly. This may cause considerable difficulty in removing the core from the molded piece during molding.

It is of utmost importance that straight holes be highly polished (finished with a draw polish in the direction of withdrawal to remove all visible annular marks) or chromium plated to reduce the "drag" or friction during withdrawal. Drag causes distortion of the molded piece which is still somewhat soft at the time the mold is opened and the piece is ejected.

Holes for Screws

Holes for self-tapping screws can be either molded in or drilled after molding, depending upon the holding strength required. When thermosetting materials are used, a molded hole is much stronger in thread strength after tapping than a drilled hole. This is because of the hardened surface (characteristic of molded thermosetting materials) extending down into the hole into which the threads are to be cut.

Thermoplastic materials do not have this advantage and have practically the same strength at the surface whether molded or drilled, as far as tapping is concerned. It is generally not practical to drill and tap into any plastics material using the standard machine-screw threads rather than self-tapping screws. Stripping of the threads occurs very easily with moderate tightening of the screw. Molded-in metal inserts are always many times stronger than *any* type of tapped holes in plastics, assuming that a good coarse knurl or other anchoring means is provided to prevent loosening of the insert under strain.

Undercuts in Molded Pieces

There are internal and external undercuts. To mold an undercut on the *inside* of a molded piece requires one of the following procedures:

1. Use of a collapsible core
2. "Bumping" or "stripping"
3. Machining after molding
4. Molding in two parts and assembling
5. Hot forming to produce undercut (thermoplastics only)

An undercut on the *outside* of a molded piece may be accomplished by:

1. Molding the piece on its side
2. Use of a split cavity mold
3. Use of one or more side cores
4. "Bumping" or "stripping"
5. Machining after molding

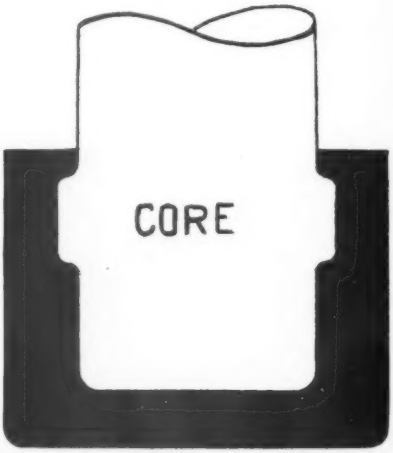


Fig. 26—This part can be "bumped" or stripped off the core by means of a stripper plate ejector if sufficient radii are used on the shallow undercut.

6. Molding in two parts and assembling
7. Hot forming to produce undercut (thermoplastics only)

Collapsible Cores

Generally, a collapsible core is impractical in production for the following reasons:

1. Expensive to make
2. Allows flashing
3. Is often difficult to take apart
4. Slows down production
5. Wear causes molding trouble in time.

However, there are many molded parts required, particularly for the technical market, in which cases the cost and troubles in molding are of minor concern in comparison with the value of obtaining the molded part as designed.

A collapsible core is composed of a center portion having external parts slidably mounted to it. When the center portion is withdrawn from the molded part, the side pieces are allowed to collapse together in order to be removed through the neck of the molded part.

Therefore, we can see that it is foolish to design for a deep internal undercut without first laying out the collapsible core to determine if it can be removed from the molded piece.

"Bumping" or "Stripping"

Shallow undercuts can be molded on either the inside or outside of plastics parts provided that ample radius can be allowed so that there will be no sharp corners to tear the molded part as it is pushed off the core or out of the cavity. This principle takes advantage of the elasticity of the plastic material at the time of hot ejection from the mold cavity. If done immediately as the mold is opened, the part will spring back almost 100 percent to its original molded shape.

A good commercial example of this principle is in the making of bottle caps with rounded internal threads. Specially compounded materials, however, are often necessary to obtain this elasticity without cracking. Consult your material manufacturer's representative for recommendations.

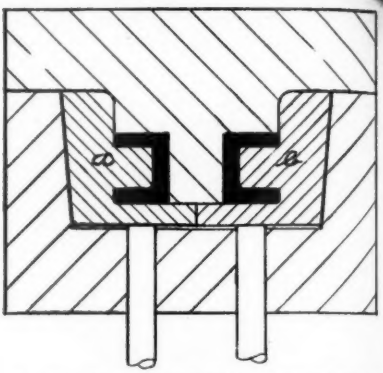


Fig. 27—Split cavity mold for molding a spool with deep undercuts around the sides. The two cavity sections "a" and "b" are ejected by pins and then taken apart to remove the molded piece.

Machining

Machining of undercuts after molding has proven to be the most practical in many cases, but there are certain factors to be considered. If the part is going to be subjected to variable moisture conditions, immersion in liquids, or if it must retain its dimensional stability very closely, machining the undercuts may prove to be unwise if a thermosetting material is used.

The reason for this is that fillers of the cellulose type absorb moisture more readily when exposed by machining than a molded surface which is nearly all resin directly at the surface. Since quality and hardness is also greater at the surface, moisture absorption and warpage increases when the surface is removed by machining.

A remedy for such a condition on a machined surface is to waterproof the surface after machining. This can be done by coating with Glyptal* and baking at 260° F to cure.

The thickness of the coating must be considered before machining.

Thermoplastic materials are changed less by absorption after machining than

(TO PAGE 120—PLEASE)

*This is the General Electric trade name for an alkyd resin with good properties for coating synthetic surfaces. Other similar coatings are "Amberlac" (Resinous Products & Chemical Co.), "Bakelite C-9" (Bakelite Corp.), "Dulux" and "Duraplex" (du Pont), "Makalot" (Makalot Corp.), "Petrix" (Hercules Powder Co.) and "Rezyl" (American Cyanamid Co.).

ESTIMATING SYSTEMS FOR PLASTICS MOLDS

Part V

by Gordon B. Thayer
PLASTICS RESEARCH ENGINEER
Dow Chemical Company

Cost estimating for plastics molding requires thorough consideration of several factors. These factors may be listed as follows:

1. Estimate of tooling costs.
2. Estimate of plastics materials and other raw materials costs.
3. Estimate of fabricating operations.
4. Summary of cost factors in a standardized form.
5. Use of accounting department records and maintenance of accurate, up to date information.

The importance of correct cost estimates in setting adequate selling prices needs no supporting arguments. If prices are too high, business goes elsewhere. If they are too low, the result is the same in the end because the manufacturer has to quit. A well calculated cost estimating system is a necessity for the plastics molder. It allows his quotations to be in line with those of his competitors and with his costs, and it minimizes the expense involved in making quotations.

A system of deriving time estimates for molds has been described as a part of this series on estimating. Because estimating the time required to build tools is one of the most difficult items in the task of providing cost figures for quotation purposes, methods of time estimating were discussed rather extensively. However, there is more involved in the cost of plastics tooling and manufacturing than the cost in hours required to build the tools. Also, the cost of the tools may be only a small fraction of the total value of the order, and the estimates for the material and manufacturing operations costs then outweigh the tool estimate in importance.

The multiplicity of items which are involved in determining a quotation price is sufficient to require a standardized summarization procedure. This helps to prevent omission of some of the items, and it places the estimating on a business-like basis. Some discussion of the subdivisions of estimating work is required to develop a method of summarizing the various estimates in the form of a satisfactory quotation.

In the first place, accounting department procedures and records must be followed by the estimator, and adapted as much as possible by the accounting department for his convenient use. As the discussion proceeds, the relationship of the accounting procedures and records to the estimating procedure will be shown.

Elements of Tooling Costs

Besides the time in hours required to build tools for a given plastics part, the items of materials, maintenance and amortization of the tools enter the estimate. Overhead costs for keeping the toolroom also must be included.

The cost of the steel for a mold is not usually very much in proportion to the labor involved. But it should be estimated, usually on a weight basis, although stock parts such as plates, and pins may be purchased machined to size. Especially is it important to look into the steel cost if a new type of mold is contemplated, or is one with which the shop has had no previous experience. Many times the estimator will be able to use a standard, previously established figure for the material cost of a mold, provided the mold is something like a number of molds which have been produced in his plant. It isn't necessary to

figure the cost of every screw every time a mold or fixture is estimated, but it is necessary to know that the new tooling is nearly the same as tooling previously built and analyzed for material costs.

Estimating the cost of tool maintenance requires some records and experience. Most molding plants have a procedure for entering costs of maintenance on the books of the accounting department, with costs charged against each tool. It is often difficult to follow a tool through the books over a period of several months or years to arrive at typical maintenance costs. However, it is good practice for the estimator to select typical tools and follow them carefully and keep track of the nature of the repairs, the hours of actual running time, and the cost in hours for the repairs. In a few months a good basis for maintenance estimating may be established. These data may then be applied with good judgment to new estimates.

If the contract molder produces tooling for a plastics part and then charges the cost to his customer, he should not figure tool amortization in the cost of the finished pieces. However, if he undertakes to sell a finished part for a given price and underwrites the tooling cost, he must include a charge for the tooling upon each piece delivered. Such amortization is usually computed on a basis of expected number of parts during the tool life, or expected total number of parts, whichever is smaller. If, for example, 100,000 moldings are expected to be ordered from a mold, and the cost of the mold is estimated to be $1000, a charge of $10 per thousand pieces should be added for mold amortization. This amounts to one percent per molding, and this much is important in a piece, for example, which sells for 20 cents. The mold amortization is 5 percent of the selling price of the molded part. Here it is not difficult to foresee disastrous results if mold amortization charges are ignored.

It is not uncommon for orders of 20,000,000 parts to be received for a seasonal item such as an automobile trim part. One mold cavity, of course, would not produce at the required rate. Perhaps 100 cavities would be required, and each one then would be pro-rated 200,000 moldings. Some of the cavities might last long enough to produce twice that number, but probably half of the cavities would not last long enough for 100,000 moldings. So the mold amortization estimate requires careful study. How many times the mold must be rebuilt during the run must be estimated, and charges must be added accordingly.

Suppose a manufacturer of refrigerators plans to build a special lot of 10,000 units during a season and a molded door handle is required which is intended to be changed when the next season's models are designed. The mold will not be worn out when the run is finished, but it will have ended its useful life except for service parts production. The amortization should be computed by absorbing the total mold cost in 10,000 pieces and it might be as high as 10 cents per piece.

Usually the portion of overhead costs known as factory expense is computed by the accountants. The various factory departments may incur different portions of the factory expense according to accounting estimates and records of how much it costs to supervise and maintain them. Tool rooms usually average 90 percent to 110 percent factory cost factor. This means that 90 percent of the direct labor cost, for example, should be added to the eestimate of a tool. If the wage schedule calls for $1.50 per hour for the tool maker, and the time estimate is 100 hours, the direct labor cost is $150. The factory expense is 90 percent additional, or $135. Some mold shops charge a flat hourly rate which includes direct labor and factory cost. This is satisfactory if the mold shop is a unit by itself and not a part of a large organization. The accounting system for the single unit is relatively simple compared with the system which must be devised to care for 20 to 100 departments.

The engineering costs of plastics tooling are appreciable. In most systems of cost accounting, the engineering, planning, supervision, and other so-called office departments are considered to be a part of the general burden of the plant. For this reason, the cost of planning the tooling and manufacturing operations is not included directly as such in the estimate. It is satisfactory to cover engineering costs in overhead expense items, if only an ordinary

Weights of Various Plastics Materials — Molding Grades

	Sp. Grav.	Oz./cu. in.
General purpose phenolic	1.42	.82
Mineral filled phenolic	1.95	1.12
Urea-formaldehyde	1.45	.84
Melamine-formaldehyde	1.45	.84
Polystyrene	1.07	.62
Vinyl Chloride-acetate	1.35	.78
Vinyl Chloride	1.40	.81
Vinylidene Chloride	1.70	.99
Cellulose acetate	1.34	.77
Cellulose acetate-butyrate	1.21	.70
Ethyl cellulose	1.14	.66
Methyl Methacrylate	1.18	.68
Nylon	1.13	.65

To convert to oz./cu. in. multiply sp. grav. by 0.577

Fig. 23

amount of engineering time is required. Ordinarily 10 to 20 hours of engineering serves to lay out from 100 to 500 hours of tool room work. If the estimator foresees that a certain job will require more than the usual amount of engineering, he may make an allowance for it in the estimate. In some such cases he may lose the job but he may avoid considerable loss at the same time.

In the estimate summary sheet the items of tooling costs as discussed are shown in their proper order so that simple additions may be made as each item is computed and placed on the list.

Elements of Raw Material Costs

Determining the weight of plastics material per manufacturing unit is an important part of the cost estimate. In addition to the net weight of plastics material in the finished piece, the amount of lost material in the form of excess mold charge, flash, sprues, and waste must be allowed as accurately as possible. If the estimator forgets about an operation which is required to build the tooling, the cost of the tool is increased by the amount of the mistake. But the added expense stops there. Not so if the material estimate is incorrect. The loss goes on and on, as long as the part is manufactured. This holds true for all of the manufacturing operations.

The weight of the molded part may be calculated by determining the volume if no model is available for weighing. This is sometimes tedious but it cannot be avoided if no other good method of determining the weight is available. For extremely critical work the molder may sometimes have the opportunity to build a sample mold to check the mold design, tolerances required, shrinkage allowances, performance of plastics as adapted to the part, and various other factors. Then the estimator is in luck as he may find out some good information about the weight of the piece, and the excess material which must be used to make the part. Some general experience in determining the weight of plastics materials required for moldings is summarized in the following tables.

The tables of weights of molding plastics given in Fig. 23 is a general guide. The exact specific gravity for a definite formulation may be slightly different from the average values given in the table. It is recommended that the estimator use specific gravity figures from the material manufacturer's catalog which describes the molding material which is specified for the part.

The amount of material which must be added to the net weight of a molded part varies with the type of mold, the kind of material and the method of loading, among other factors. Fig. 24 is a table of average allowances for excess mold charges for compression molds. Fig. 25 is a table of material allowances for injection molding.

The percentage excess mold charges shown in Fig. 24 are representative of ordinary molding conditions. A transfer mold which molds a heavy piece will have less percent excess mold charge than a similar mold used to make a fairly small part. Some positive molds may require much less excess mold charge than is shown in the table, especially if they are new and the clearances are small. Flash molds for thermoplastics may require more excess charge than is shown because of poor heat transfer to the unmelted portion of the charge which may float out before the mold is closed and filled.

In Fig. 25, no tabulation can be made for sprues, runners, and cold slugs as this weight must be computed for each mold. There should be no appreciable

Average Excess Mold Charge for Compression Molds

Material	Transfer		Positive		Semi-Pos.		Flash	
	Preform	Powder	Preform	Powder	Preform	Powder	Preform	Powder
Thermosetting	20%	20%	5%	8%	15%	20%	25%	30%
Thermoplastic		20%		8%		20%		30%

Fig. 24

Average Excess Molding Material Allowances for Injection Molding

	Molding rejects	% Waste	% of Scrap Recoverable			
			Black	Dark colors	Light colors	Crystal clear
Thermoplastic Materials	3% to 12%	2% to 5%	85	60	50	10

Fig. 25

flash loss for properly built and maintained injection molds. Molds which have a large projected area subject to the pressure of the incoming material may flash enough to make an appreciable amount of waste. The flash is usually considered to be not recoverable because it is so thin that it will not be hit by the scrap grinder knife blades. The percent of scrap recoverable shown in the table includes all molding scrap, rejected moldings and sprues. These percentages are rather low, but they cover approximately the amount of material which may safely be reused on the same job. Up to about 90 percent of the total scrap, regardless of the color is usually recoverable for reprocessing to darker colors or to black. Often however, the cost of reprocessing makes the recovered material approach the price of new material.

If metal, wood, or plastics inserts such as screw studs, nuts, special fasteners or inlays are to be molded in the piece, the cost of these items must be included in the estimate. Some of the inserts will be lost in the course of their travel through the factory, and due allowances must be made. The nature of the insert determines the percentages of inserts which can be recovered undamaged or which can be reconditioned after recovery from the rejected moldings. A 1 percent to 2 percent allowance of excess stock should be added to cover unaccountable losses when the inserts are en route through the manufacturing operations. The workmen may drop them in the molding plant or pieces may be spilled out of the carrying boxes.

If thermosetting molding material is used for a molded part, very often the powder will be pressed into preformed pills or pellets. Often a special preform die will be required for a specific mold when standard round or rectangular preforms will not fit the work. These dies may be simply a pair of punches and a die to be inserted in the preforming machine adaptors. Or they may be complete molds made to fit in a hydraulic press as in the case of preforming molds for high-frequency preheated mold charges which consist of a single preform weighing up to 3 pounds or more. The preforming costs should be figured as a separate operation in the same manner as are other manufacturing operations.

Elements of Fabricating Operations

In making the estimate of fabricating operations, the first step is to list the operations in order. Typical operations are usually printed approximately in proper order on the estimate work sheet.

Next the rate in pieces per hour may be estimated and transposed through the operators' hourly basic rate to cost per thousand pieces, or per manufacturing unit which may be in hundreds. The estimate work sheet shown in Fig. 26 is set up for a single hourly rate for all operations, although in many plants the rates are based on time studies which consider the relative difficulty and intelligence required to do the work.

The rate in pieces per hour for the various fabricating operations has to be estimated on the basis of past experience and knowledge of plastics manufacturing. Daily production records are essential in order to establish rate data.

ESTIMATE SHEET

CUSTOMER _____ PART _____ No. _____ DATE _____

TOOL ESTIMATE	MAT'L	HOURS	LABOR
MOLD	$		$
FIXTURE			
FIXTURE			
JIG			
(%) FACTORY EXPENSE			
MATERIAL COST TOTAL			
TOTAL TOOLING COST			$

AMORTIZE TOOLS ON _____ M PIECES

TOOL MAINTENANCE $ _____ PER M

SUMMARY PER M

QUANTITY		
MATERIAL		
FACTORY COST		
TOOL AMORT.		
TOOL MAINT.		
SET UP CHG.		
TOTAL		
% SALES & ADMIN.		
TOTAL		
% PROFIT		
QUOTE		

MATERIAL ESTIMATE

KIND _____ COLOR _____ FLOW _____

WT. OF PIECE	LB./M	
WT. OF SPRUE	LB./M	(OR XS MOLD CHG)
TOTAL	LB./M	
% REJECTS	LB./M	
TOTAL WT.	LB./M @	¢/LB.
GROSS MAT'L COST	$ /M	
SCRAP CREDIT LB.@	¢ $ /M	
NET MAT'L COST	$ /M	
INSERTS	$ /M	MOLDINGS
TOTAL MAT'L COST	$ /M	

FACTORY COST

OPERATOR'S RATE $ /HR.

PREFORM	Pc/HR.	$ /M
MOLD		
INSPECT		
TRIM		
DRILL		
TAP		
TOTAL DIRECT LABOR		$ /M
% FACTORY EXPENSE		
% REJECTS		
MACHINE CHARGE $ /HR.		
TOTAL FACTORY COST		$ /M

The estimator must build up a knowledge of current jobs and then translate this knowledge over to estimated rates for similar operations.

To the sum of direct labor costs is added factory expense which is usually figured as a percentage of the direct labor cost. Then machine amortization is sometimes considered separately for the various machines or machine departments. The amortization rates are set up as hourly charges for the machines, and power consumption and maintenance are usually included in the same figure. The accounting department usually supplies these figures, although in some cases the estimator and the accountant may be able to do a better job together in setting up the charges, because each has detailed knowledge of operations unfamiliar to the other one.

Form of Summary Sheet

Fig. 26 is a typical estimate summary sheet. Much information is condensed to go on this sheet. Usually the estimator keeps additional notes and calculations which he made while computing the items for the summary sheet.

This particular sheet is divided into four sections—the tool estimate, material estimate, manufacturing estimate and the summary table which includes the formula for computing the quotation price. The sheet shown is a composite made up after a study of several estimate work sheets. It contains material which some estimators may not care to use, and, likewise, some material is omitted which other estimators prefer. Usually an estimator must work out his own form of work sheet if one is not already available. Necessary general information includes customer, part name, number if any, date, and job number. The tool estimate summary on this sheet is rather brief and it could be longer if more than one sheet were used. There is some objection to using both sides of the sheet because carbon copies are often desired or required in the system. A two sheet summary form with space for tool and part sketches, volume calculation figures, manufacturing layout plans, and other notes by the estimator has favorable points.

Two kinds of forms may be desirable when compression molding and injection molding are being estimated. Then each work sheet may be made to apply more specifically to the kind of work involved.

The summary section of the work sheet shown in Fig. 26 has space for two different order quantities. Large quantities per run are economical due to less set up charge per piece. Some firms omit set up charges for runs of 6 days or more. An item of sales and administration costs is added to the manufacturing cost to cover the general charges for these departments because they are not figured in the factory expenses charged against the various operations.

The details of how far the responsibilities of estimator, sales manager, and chief accountant extend are varied from plant to plant. There must be mutual cooperation and freedom to suggest procedures and changes within plant policies in order to make the cost estimating system flexible enough to provide good price figures.

The estimator should not hope to calculate every item exactly. Unforseen difficulties may make some items badly underestimated. However, the skilled workmen and supervisors in the organization usually are able to make up losses on one operation by gains on another, so that carefully made estimates will balance out. If the operations are divided into small enough units for estimating it is easier for the estimator to see what is involved and provide cost figures close to the actual costs. Guessing at some items and lumping others together is not the way to prepare cost estimates.

Mr. Thayer has based his Estimate Sheet on data from shops with which he is familiar and on data which he has collected. We believe it is comprehensive and that it should be useful as a checklist. We welcome comments from estimators, shop superintendents, tool and mold makers, accountants or others whose record systems may differ. Tool or material estimates, processing or fabricating data or the form of the summary table should show the method used for normal estimating. Address Industrial Plastics Editor.

SPI FALL CONFERENCE

Sessions Attract Record Attendance

The SPI Fall Conference held at the Waldorf Astoria Hotel, New York, on November 13 and 14 attracted a record attendance of over 1,200 registered members and guests who participated in the very comprehensive program of business and technical sessions.

Preceding the regular program a panel discussion was held on Sunday, November 12 between leading architects of the New York Chapter AIA and representatives of SPI. Valuable information for both groups was developed by well handled questions and answers.

Business sessions were held both mornings. The first session was presided over by W. H. Milton, Jr., manager Plastics Division, General Electric Co. Col. E. W. Rawlings, Chief, Readjustment Division, AAC, spoke on "Contract Termination and Adjustment" and Maurice Austin of Klein, Hinds & Finke, discussed "Tax Relief and Refunds".

The second morning was given over to the SPI Business Session. In a forceful President's Message, George K. Scribner reminded the industry that its growth brought with it greater responsibilities and warned member companies against the pressure of the production manufacturers who, while fully engaged in war contracts themselves, were trying to fill warehouses with plastic parts for reconversion products. He stated that getting out of the war was going to be difficult at best. He also emphasized the value of proper, intelligent advertising stating that the industry must advertise because it must exist. Wm. T. Cruse, executive vice president, made a comprehensive report of the SPI activities. N. J. Rakas, alternate chairman, Engineering and Technical Committee, gave a preview of the new plan of tabulating physical properties. K. H. Braithwaite, Duplate Canada, Ltd., made the report on the Canadian Section; Roy L. Peat, president, Plastic & Die Cast Products Corp., reported on the Pacific Coast Section; and Elmer E. Mills, president, Elmer E. Mills Corp., reported on the Mid-West Section.

A technical session the first morning was presided over by Clinton W. Blount, vice president and general manager of Bakelite Corp. Two papers were given, one by N. J. Rakas and W. P. Cousino, project engineers of Chrysler Corp. on "Chrysler Plastic Machine for Continuous Injection and Extrusion of Thermosetting Plastics", the other by Philip H. Rhodes, chief of Research and Production, Pennsylvania Coal Products Co. on "Resorcin Resins and Adhesives". Considerable interest was exhibited in the new continous injection machine which can handle thermoplastic as well as thermosetting materials. While the machine was stated to have been developed primarily to inject large parts, pipes of 1⅞", 3" and 5" OD and ¼" wall thicknesses, made from a macerated paper base phenolic, have been extruded. A number of slides were shown to illustrate the present design progress and functioning of the machine. Mr. Rhodes described the development and uses of resorcin (neutral or slightly alkaline modifiers for room and intermediate temperature setting adhesives) resins and adhesives. Research has indicated that paper and fabric laminates have been prepared with physical properties of greater strength than similar materials made with other resin types. Mr. Rhodes mentioned postwar applications which included marine, aircraft, furniture and building construction.

Group Meetings Held

Group meetings were held the first afternoon. The Button Group with Neil O. Broderson, president, Rochester Button Co., as chairman, heard George E. Meyers of Ernst & Ernst who spoke on "Job Evaluation". Contract termination were discussed by members of the Army Service Forces. Mr. Broderson addressed the Group pointing out that the growth of production facilities was a threat to the industry on the forthcoming peacetime markets. He presented

data based on estimates by industry members which led him to predict that the expected normal business in 1947 would approximate the 1939 level, approximately 40 percent below the 1944 volume. The Compression Group under the chairmanship of James B. Neal, president, Norton Laboratories, Inc., heard two speakers—Henry M. Richardson, consulting engineer, Pittsfield, Mass., who spoke on "Refinement of Product Through Control" and C. H. Frantz, general manager, Kurz-Kasch, Inc., who spoke on "Practical Aspects of High Frequency Heating in Compression and Transfer Molding".

The Injection Group meeting with Daniel D. Whyte, heard Dr. J. W. Shackleton of du Pont on "Polyethylene"; C. L. Jones of Monsanto Chemical Co. described the properties and uses of "Cerex and HT Styrene"; Shailer L. Bass of Dow-Corning Corp. outlined the variety of forms in which silicones, a new class of high polymers are at present available. L. J. Morrison of Detroit Mold Engineering Corp. spoke on "Consideration in the Standardization of Die Parts".

The Extruder Group met with Chairman Elmer Szantay, general manager, Sandee Manufacturing Co. and heard W. A. Evans of Bell Telephone Laboratories on "Standardization of Material Testing Methods", W. J. Johnson of National Rubber Machinery Co. on "New Trends in Extrusion Equipment" and Paul Quinn, consulting engineer, on "Extruded Materials in England and the United States".

The Machinery Group presided over by F. G. Schranz, vice president of the Baldwin Southwark Division of the Baldwin Locomotive Works, heard M. E. Engebretson, advertising manager, The Oilgear Co. talk on "Molding Machine Pumps and Their Circuits" and J. D. Houghton of the Facilities Branch WPB on "Allocations of Plastics Machinery".

Two New Groups Formed

Two new Groups made their appearance. A Fabricating Group with Roy F. Layton, secretary, Lusteroid Container Co., Inc. as program chairman, held an initial session. R. P. Piperoux, Celanese Corporation of America, read a paper on "New Developments in the Fabricating of Thermoplastic Sheets"; J. J. Micik, Control Laboratory, International Printing Ink gave the newest facts on "Printing Ink for Use on Plastics"; and A. S. Zimmerman, Bakelite Corp. reviewed "Cast Phenolic Resins: Their Properties, Styling, Fabricating and Where They Should Be Used". A committee to act in setting up a permanent SPI Fabricating Group was appointed. Included are Mr. Layton, temporary chairman, Mrs. E. W. Levien, C. H. Hunton, Ted Swedlow, A. S. Zimmerman, Howard Yates, Morris L. Dinell and Irving Felzenthal. An organizational meeting of the Low Pressure Group with W. Burdette Wilkins, consulting engineer, as temporary chairman, was held. Tentative plans are under way for a general meeting of the group before the next annual meeting.

Merchandising Forum

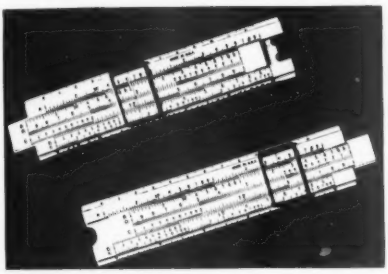
A Merchandising Forum on plastics, presided over by James R. Turnbull of Monsanto Chemical Co., brought out information on postwar market possibilities in a number of fields. The panel, all trade publication editors, included F. H. Waggoner of "Premium Practice", Archer E. Knowlton of "Electrical World", Julien Elfenbein of "House Furnishing Review", Dr. O. H. Caldwell of "Electronic Industries". R. H. McCready of "Playthings" and C. W. Browne of "Modern Packaging".

Luncheon speakers were John L. Collyer, president, B. F. Goodrich Co., who spoke on the "Outlook for the Rubbers and the Plastics" on the first day and Lew Hahn, general manager, National Retail Dry Goods Association, who spoke on the subject "What the Retailer Expects of the Plastics Industry" the second day. Dinner meetings heard Colonel Willard Chevalier speak on "When Plastics Come Home from the Wars" and Admiral W. H. Standley, U.S.N. Ret., on "How We Can Work with Russia".

A feature of the Fall Conference was a display of exhibits from member companies. A wide variety of parts and products, largely of war application, were shown. The exhibit, which attracted many visitors, was considered of sufficient value to the entire industry that an effort is being made to hold the loaned items together for display in leading cities all over the country.

PRECISION DIES OPEN NEW FIELD FOR MOLDING ENGINEER'S SCALES

The first successful injection molding of slide rules, protractors, engineers' and architects' scales and other widely used designing room instruments is reported by Pereles Brothers, Inc., custom molders of Milwaukee, Wis.



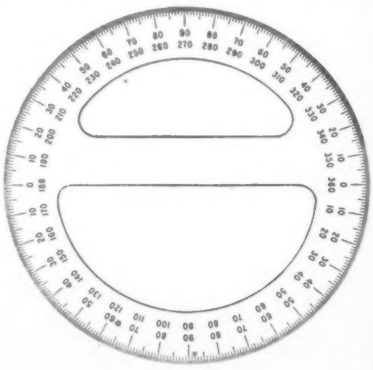
After numerous attempts to obtain dies with the accuracy necessary to mold such items, this company installed special equipment and special methods in its own engraving, tool and die departments to do the job. It has been possible to maintain a dimensional tolerance of .0005" per inch between lines as delicate as .003" to .0035" in width of graduations or calibrations on the various instruments and a depth of .005". The importance of this control is evident when it is remembered that there are as many as 1600 lines on a five-inch pocket slide rule and double that number on the standard ten-inch rule. On the triangular rules, there are over 2500 graduations and as many as sixty lines to the inch. Another feature is that the lines are deeper than they are wide, increasing the life of the instrument and making it easier to wipe in the color.

In some cases, instruments, such as triangular relief facet scales, are being produced complete and ready for use in 24 hours by thermoplastic molding. Previously, two to three years were required for boxwood or celluloid faced boxwood scales. Seasoning of the boxwood tool was twenty-four months, and if celluloid was applied, another twelve months was required for it to set and cure properly.

The five-inch pocket slide rule is the first molded all-plastic type ever made. Even closer tolerances than those mentioned above are held between scales. There are different models with different scales, one of the most popular having scales of A, B, Cl, C, D, K, S, L and T, with millimeter and inch scales on the beveled edges. Both this and the ten-inch rules, both in production, are fully adjustable.

Lucite (du Pont), Plexiglas (Rohm & Haas) and Polystyrene (Bakelite, Dow and Monsanto) are used to mold the slide rules.

The triangular scales require only one full day for complete manufacture, including normalizing. This latter process is exclusive with this company. In recent tests of the triangular scales under conditions of high humidity, it was shown that they are unaffected by high moisture content of the air. Similar tests made of boxwood scales with celluloid faces resulted in peeling or loosening of the celluloid, rendering the scales



useless. Both triangular and flat four-bevel scales in 6" and 12" sizes are molded of Lucite or Plexiglas. Both round and half-round protractors are also injection molded from transparent Polystyrene. Both models have half degree graduations.

Large numbers of molded rules and other instruments are made for service agencies and war industries. Details of die design and construction are restricted. The precision dies, by maintaining close tolerances in quantity production of injection molded products, eliminated many of the individual operations on each item, speeding output and attaining greater accuracy without a need for highly skilled labor otherwise needed.

The Pereles Company, said to be the leading manufacturer and distributor of engineering and architectural supplies, is in quantity production on molded all-plastic instruments.

Holes and Undercuts

(CONTINUED FROM PAGE 110)

are the thermosetting materials. However, dimensional control is much more difficult with thermoplastics than with thermosetting materials.

Parting Line Across Undercut

An external undercut can often be conveniently molded by turning the piece on its side in the mold design so that the direction along the undercut groove is parallel with the direction of mold opening and the groove will no longer be an undercut but could slide easily out of the mold.

Flashing will occur across the parting line where the mold comes together and this flash line will go across the groove and down into it. If it is necessary for the groove to function as a sealing groove when in service, there may be leakage between the seal and the groove surface at the parting line or flash line if the flash is not entirely removed on every piece. Transfer molding flashes the least, compression molds flash the most, and flash in injection molds depends upon mold construction and molding pressures required.

A better method from the standpoint of flashing is to use a split cavity mold with the cavity halves tapered on the sides so that, as the mold closes, the two halves will be wedged together to prevent any flashing. This leaves a visible parting line but no flashing can occur.

Split cavity molds are very commonly used and can be applied with compression, transfer, or injection molding. Ejector pins push the halves of the split cavities out of the mold. The two halves are then taken apart and the molded piece removed.

Side Cores for Limited Undercuts

Undercuts that do not extend completely around the piece but only in a small portion of the piece could be produced from a side core located in the side of the mold. The side core is withdrawn from the cavity sufficiently to allow removal of the molded part. Molded lettering on the side of a plastics part in effect forms an undercut on each letter and a side core which is engraved on the end to produce the lettering is often used. One advantage of this is that the core can be removed and another core of different end-design can be substituted. This often saves the making of a new cavity when a different design is necessary.

The next article will be "Inserts in Molded Plastics".

★

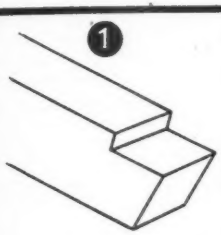
Heat-Resistant "Lucite"

A heat-resistant composition of "Lucite" molding powder that yields molded articles capable of withstanding service temperatures of 30° to 50° F higher than those molded from standard methacrylate powders is entirely in war production according to the manufacturer—the Du-Pont Company. The material is made in two granulations—small grain for compression molding and coarse grain for injection or extrusion molding. The same cycles normally used are employed. *INFORM-A-GRAM KEY No. 859-S*

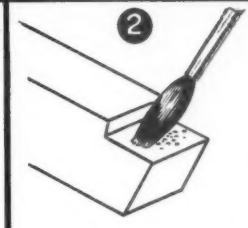
Tips on Tipping

COOPER-BESSEMER MEEHANITE TOOL BODIES

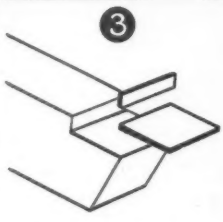
In hundreds of busy war plants, machine shops are saving money and critical tool steel by brazing carbide cutting tips on Cooper-Bessemer Meehanite Tool Bodies. If you are not doing it, the sketches below will show you how simple the operation is:



Mill necessary recesses in Meehanite tool body to suit type of tip.



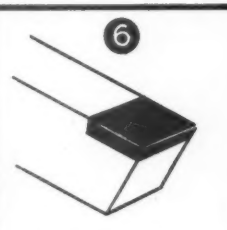
Clean all surfaces to be joined (both recess and tip) with carbon tetrachloride.



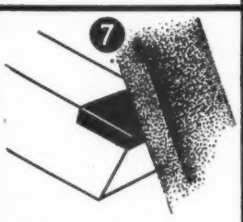
Cut strips of silver solder to conform to sides and bottom of carbide tip.

Coat recess surfaces with flux. Lay silver solder in place, coat lightly with flux. Grind side and edge of tip and lay in place.

Heat tool bottom underneath recess, working up sides, till molten solder flows freely (Temp. 1275-1300° F.). While heating, the tip should be held in place firmly by a steel rod.



To prevent checking, cool tool slowly, burying it in asbestos, mica or lime. Do not cool in water.



Finish grind tool, honing razor edge on tip to .005" radius to prolong tip life.

Meehanite is ideal for tool shanks, milling cutters and forming tools. Furnished by Cooper-Bessemer, they are well-designed, properly balanced and carefully made. They are easy to finish machine. They absorb vibration, eliminate tool chatter. They permit faster cutting because they dissipate heat faster and do not load up so fast. SEND FOR BULLETIN 53-T-2.

THE Cooper-Bessemer CORPORATION
Industrial Tool Division
Dept. J, Mount Vernon, Ohio

Flying Bazookas Utilize Plastic Tubes

While no information has been released as to the resins being used, it was recently revealed that a special resin impregnated paper is being used for the tubes of airborne rocket launchers or "flying bazookas," which are being used against enemy ground forces, and which are a direct offspring of the famed infantry bazooka. It is the first publicly announced modern weapon utilizing a non-metallic barrel or tube.

The tube was developed by General Electric's Plastic Division and the Byron Weston Company. In addition to being fire-resistant, to withstand the terrific heat incident to launching the rocket missiles, the tube is light in weight and well suited to installation on planes.

General Electric has produced thousands of the flying bazookas in their plant at Lowell, Mass., and the Firestone Tire & Rubber Co. is also in volume production of the rocket launchers in their reconverted antiaircraft plant at Akron, Ohio.

The rocket launching tubes are described as 10' long and 4½" in diameter. The bazookas are mounted under each wing, three in a cluster. Weight of the rocket installation is approximately 450 pounds, and the walls of the tubes are about ¼" thick. The rockets may be fired singly or in salvos, or may be dropped as bombs on a target. Like the infantry or anti-tank model, the rockets are discharged electrically.

For use by paratroopers during the invasion of France, a new folding model was designed, and this new model is now standard for invasion forces as well as paratroops and jungle fighters. Having the same general appearance of the old rocket launcher, the new tube however is of knockdown construction and the barrel is carried in two pieces, a definite advantage in both jungle and open terrain warfare.

Development of the bazooka is an example of cooperative effort in which military, naval and civilian agencies all played a part, according to Col. L. A. Skinner of the Rocket Development Division, Ordnance Research and Development Service.

In 1941, tests were made of an armor-piercing projectile designed by and brought to this country by a young Swiss engineer, Henry H. Mohaupt, now a private in the Ordnance Department of the Army—and the device performed amazingly well.

By May, 1942, the rockets and launchers were developed to the point that a number of demonstrations and tests were carried out, culminating in a large and formal one at Camp Sims, S. C., in June, 1942, where the bazooka was shown in action against a medium tank before officers of the War and Navy Departments and the National Defense Research Council.

In explaining how rockets function upon striking a tank, the War Department said: "the rockets themselves do not penetrate armor, but punch a hole through thick steel plate by a terrific concentrated and directed blast that throws hot fragments of steel around inside the tank. In some cases rockets have blasted as much as 6 inches of armor plate."

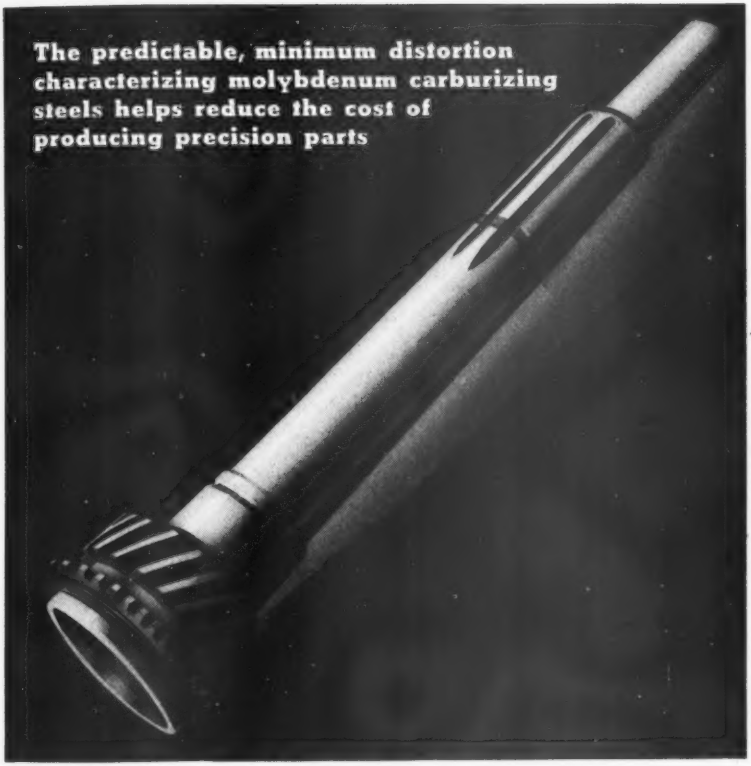
★

Durez Casting Resin

The rapid development of casting resin in applications to aircraft tooling makes this 8-page bulletin "Durez Casting Resin" of timely interest. The bulletin presents a technical discussion of Durez 7421 resin and gives full instructions for its use. Sections on patterns, mold making, mold preparation, mixing resin with catalyst and fillers, curing or baking, wooden cores, inserts and finishing and mounting, while brief, are practical for the shop man seeking procedures to follow.

Tables of typical properties include shrinkage from mold dimension in inches per inch and give strength data of cast parts after the initial curing bake and for "after bakes" at three subsequent periods. The "after bake" is considered an accelerated aging test. A good many practical shop suggestions on operations and some excellent photographs add to the value of the bulletin. A supplement on an improved casting resin, Durez 7421A, which produces a much stronger casting, is included.

INFORM-A-GRAM KEY No. B74-S


The predictable, minimum distortion characterizing molybdenum carburizing steels helps reduce the cost of producing precision parts

Climax Molybdenum Company

500 Fifth Avenue · New York City

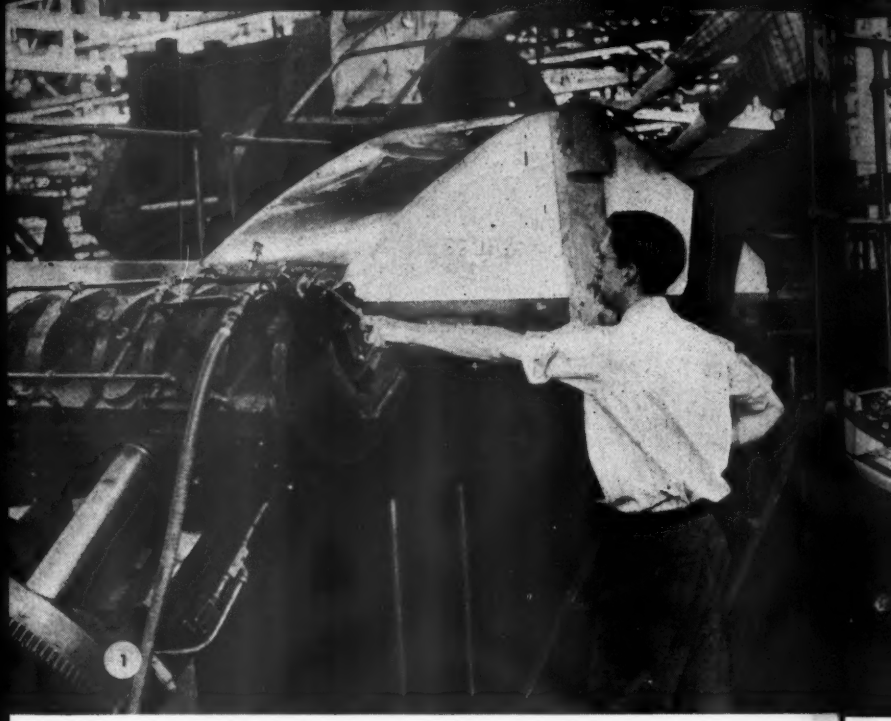
MOLY

CLIMAX FURNISHES AUTHORITATIVE ENGINEERING DATA ON MOLYBDENUM APPLICATIONS.

ARMY E NAVY

MOLYBDIC OXIDE, BRIQUETTED OR CANNED • FERROMOLYBDENUM • "CALCIUM MOLYBDATE"

Catalin CASTINGS SET NEW PRODUCTION RECO



1 Splice section skin stretched over a cored plastic form. Two parts are stretched in one piece and scribed before the part is released. The template is shown being lowered into position.

2 Large draw dies like this can be cast right in your own plant. When used for deep drawing, the "orange peel" effect obtained with wood or metal punches is eliminated.

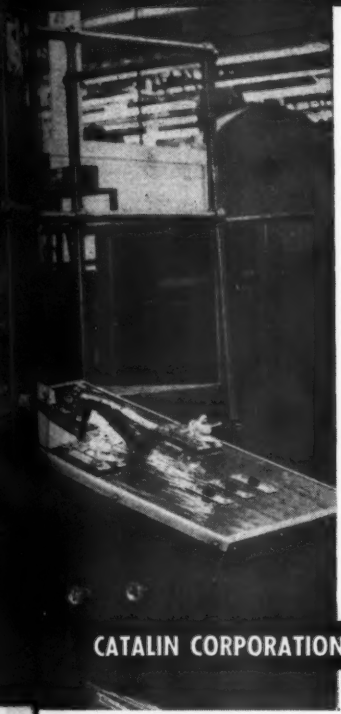
3 Plastic tools totalling 21,000 pounds in various stages of work. Those in the foreground are cored plastic stretch press forms still in the plaster molds in which they were cast.

4 Match angle fillet—14 feet long, stretched over plastic. One piece replaces a former assembly of three pieces.

5 Catalin casting resin being poured into a large plaster mold of a stretch-press die.

6 This view of a plastic checking fixture shows the station lines which are scribed into the mold and transferred to the casting. Close tolerances are a requirement of such castings.

ON RECORDS IN THE FABRICATION OF ALUMINUM SHEETS



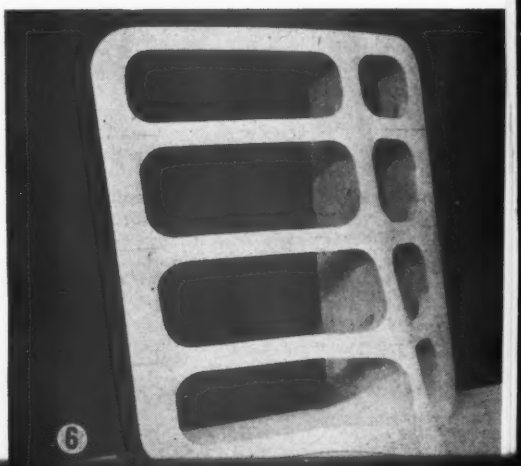
Well past the experimental stage, Liquid Catalin resins, cast in plaster molds and serving as drill and saw jigs, router, shaper and hydro-form blocks, checking fixtures and stretch press molds and dies are operating on a full time production schedule supplying essential aircraft parts.

So outstanding have been the production advantages of these Catalin castings, that existing wooden punches, etc., are rapidly being replaced with Catalin ones. These castings, because of their low water absorption, remain dimensionally true, even when stored for long periods . . .

Parts produced on draw-dies made of Catalin are of superior quality because of the even stretching of the metal and subsequent elimination of the "orange peel" effect. This also makes possible deep draws in a single operation and opens up new applications for the versatile draw-die.

Catalin engineers will be glad to share with you their knowledge, experience and know-how. Inquiries invited.

CATALIN CORPORATION • ONE PARK AVENUE, NEW YORK 16, N. Y.



Carbide Machining of Steels

(CONTINUED FROM PAGE 99)

satisfactorily cooling the work.

Usually, an increased flow of coolant is required when Carboloy type carbide tools are used. Cutting fluids should be supplied through pipes at least ⅜" in diameter. The tank should be large enough to keep the coolant temperature from rising too high. Coolant flow must be uniform and directed upon the cutting edge and point of the tool.

Coolant can be directed in a vertical jet from the bottom so it flows *up* to the cutting edge (Fig. 1). It can be directed from the side *horizontally* so it flows on top of the tool tip as in Fig. 2. Or the coolant jet can be run from the *back* of the tool parallel to the top of the tool as in Fig. 3.

If carbide tools begin to chatter, the following potential causes should be looked for: too light tool section; feed too fine; too large a nose radius; tools improperly ground; excessive tool overhang; tool too dull; improper support of work.

Meehanite Tool Castings

(CONTINUED FROM PAGE 101)

carbide tip. Press tip into recess with a steel rod. The maximum temperature during this process should be between 1275 and 1300 degrees Fahrenheit, or until the shank becomes cherry red. At *no* time should the temperature be allowed to go over 1300° F.

6. The tool should be cooled slowly by burying it in asbestos, mica or lime.

7. The tool is now ready for grinding. It should be remembered that a razor edge on the tip will cause tools to break. Hone the razor edge with a fine hone to .005" radius on the edge. This will make the tip last longer.

Where quantity brazing is justified, a production setup is employed where the heat is obtained by induction or by a gas heated furnace.

It must be remembered that Meehanite is a cast metal having a melting point of approximately 2350° hence copper brazing is not recommended since it requires a higher temperature than Meehanite will stand. Material that has a lower melting point such as "Easy-Flo No. 3" is generally used with perfect results.

Meehanite has been called the metal that bridges the gap between gray iron and steel because it demonstrates the better properties of both, i.e., the high damping capacity, and the free machining and self-lubricating qualities of cast iron; as well as the greater strength, higher resilience, and toughness, better wear resistance, and adaptability to heat treatment of steel. Its engineering characteristics are stable factors, permitting accurate and trustworthy design.

Tell Berna Addresses NTDMA Directors

A featured highlight of the November 3, 1944 meeting in Cleveland of the Board of Directors of the National Tool & Die Manufacturers Association was an important address by Tell Berna, General Manager of the National Machine Tool Builders Association. Mr. Berna's talk was inspiring on two counts, i.e., because of the constructive realism of the subject: "Importance of the Trade Association in American Industry and the Functions It Performs" and because it was an encouraging message from a dean of American trade association executives to a new association just past its first birthday.

Mr. Berna stressed that where American Industry is not understood by the people in Government it is primarily because they haven't had the opportunity to learn about it. Following though, he said "That's the No. 1 job of a trade association; to see that information about your industry is placed in those channels where it will do you the most good and to make that information so convincing that even Government officials cannot ignore it.

"Before a trade association can pass on information about its industry, it has to have that information itself. You have to collect the essential facts about your industry *now* even though you don't know when you will need them. Only after long experience can you interpret these facts intelligently."

A regional get-together of all Mid-Western tool and die manufacturers will be held on January 5 and 6 at the Hotel Schroeder, Milwaukee, in conjunction with the next directors' meeting of the National Tool and Die Manufacturers' Association.

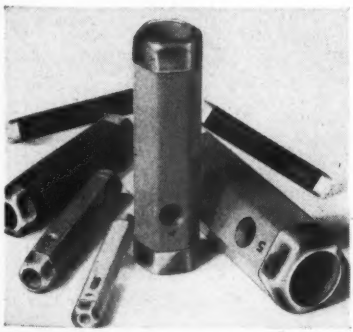
Write for New Low Prices

FEDERAL

Taperlock Plastic

GAGE HANDLES

Made of durable plastic material, one-third lighter than aluminum. This lightness permits a most sensitive "touch" with less fatigue . . . an advantage appreciated by women inspectors.



Federal Taperlock Plastic Gage Handles have proved very satisfactory for glass gages. Being so much lighter than metal handles the danger of chipping and breaking is greatly reduced.

Plastic Handles insulate, protecting gages from bodily heat which might affect accuracy.

Easily marked for identification with the same tools used for marking metal handles. Available in SEVEN sizes—00 for small gages, 0, 1, 2, 3, 4 and 5. In FOUR colors — Red, Green, Yellow and Black.

IMMEDIATE DELIVERY
On Rated Orders

FEDERAL TOOL CORPORATION

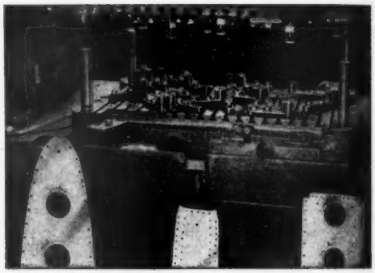
400 NORTH LEAVITT STREET **CHICAGO 12, ILLINOIS**

ADJUSTABLE DIES
SPEED WAR PRODUCTION

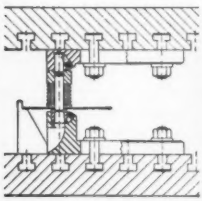
INCREASE HOURLY PRODUCTION—REDUCE "DOWN" TIME

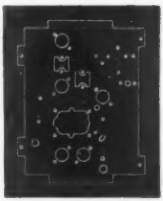
Whistler adjustable die set-up for 12 foot power brake. These same punch and die units can be quickly rearranged for other patterns.

Whistler Adjustable dies are saving the day in war plant "speed-up" schedules by...saving weeks of time normally required in single purpose die making...units can be used over and over in different patterns...new set ups on or off the press in minutes ...all parts interchangeable...work on any type press...perfect precision on long or short runs...no special tools and new workers quickly learn to make press changes.



Another grouping of Whistler Adjustable Dies illustrating re-use of same units. Note close grouping of perforations.





Side view showing construction detail of U-50 Whistler Adjustable Punch and Die unit and typical example of perforated and notched piece produced by Whistler Dies.

Over 25 Years of Tool and Die Making Experience

S. B. WHISTLER & SONS, Inc.

752-756 MILITARY ROAD BUFFALO, N. Y.

Every Production Executive needs this fully illustrated catalog. Sent upon request.

PROGRESS ON PARADE

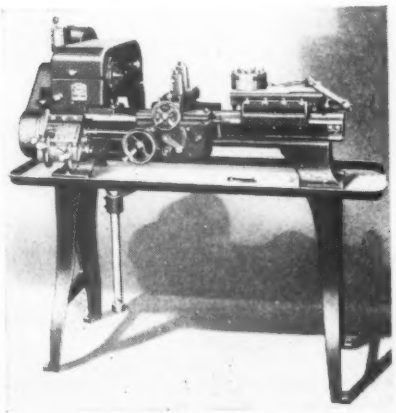
Use our postage-free Inform-a-Gram for your requests.

NEW DIAMOND BUR. The new metal bonded and supercharged diamond impregnated burs which have been developed by the Oscap Manufacturing Co. can be used for finishing cutting edges, form tools, drawing dies as well as the lapping, internal or external, of small holes, gages, etc. The Oscap Diamond Bur has diamond dust of from 80 to 500 grit impregnated in a special alloy metal bond and features a supercharge of diamonds below the regular .050 depth of impregnation. When the outer cutting surface is worn away, the lower layer of diamonds

comes into cutting range. The bur may be used for grinding high speed steel, the high temperature alloys such as Stellite, Rexalloy or the hardest grades of cemented carbides. It works best at high speeds and may be used in any tool post grinder, flexible shaft setup or regular universal tool and cutter grinder. Oscap Diamond Burs are available up to ½" diameter in steps of $\frac{1}{32}$" and with ⅛" and ¼" shanks. The OSCAP MANUFACTURING CO., Dept. J, 206 W. Saratoga St., Baltimore 1, Md., will send more information on request.

INFORM-A-GRAM KEY No. 981-S

QUICK CHANGE GEAR TURRET LATHE. The Logan Engineering Co. is now manufacturing the No. 840 Quick Change Gear Turret Lathe for handling bar stock up to and including ⅝" diameter. Its design includes such features as precision preloaded ball bearing spindle mounting; adjustable gibs to compensate for wear of turret and cross slide; and self lubricating bronze bearings protecting 35 vital points in the lathe. Construction specifications of the No. 840 which guarantee accuracy are: bed ways ground to within .0005" of absolute accuracy, total run out of headstock spindle 12" from the bearing less than .001"; lead screw held to within .002" in 12"; and turret holes bored from the headstock. The easily operated Quick Change Gear Box on the new lathe provides 48 threads and feeds in either direction. Simple adjustments of two levers make screw threads of from 8 to 224 per inch quickly available, and by changing the 24 tooth stud gear for the 48 tooth stud gear furnished with the lathe, additional threads of 4 to 7 per inch are equally accessible. Similarly, longitudinal power feeds from .0015" to .1000" per revolution of the spindle may be obtained.

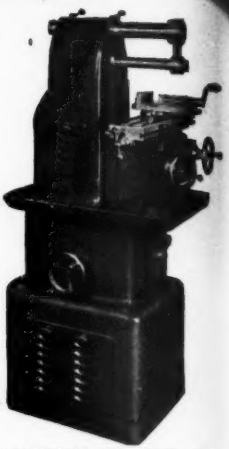


Power cross feeds are .25 times longitudinal feeds. Another feature of interest to production men is its Automatic Apron which operates from a spline in the lead screw through a worm drive friction clutch for both longitudinal and cross feeds. Full information and complete specifications on the new Logan No. 840 Lathe are available on requests addressed to LOGAN ENGINEERING CO., Dept. D, 4905 West Lawrence Ave., Chicago 30, Ill.
INFORM-A-GRAM KEY No. 2-S

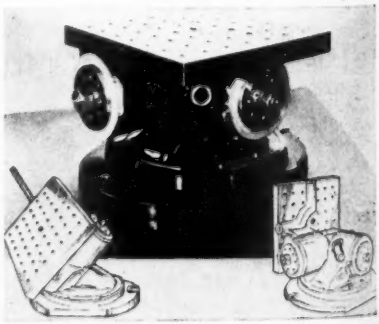
THE MAG-NO DEMAGNETIZER. The new solenoid type demagnetizer just developed by Dakon Tool & Machine Co. is scientifically constructed to give maximum demagnetizing with minimum energy consumption. Since no contact with the tool is required, scratching is eliminated and mass production demagnetizing is greatly facilitated. No special wiring is required—the Mag-No plugs into any standard AC receptacle and is equipped with a fuse type cord plug, preventing dam-

age to the demagnetizer from accidental use of incorrect voltage. Parts too large to enter opening may be demagnetized by moving them across the face of the instrument. It is equipped with 8' of approved cord and plug and an approved switch and pilot light which is readily visible in all directions to indicate when the demagnetizer is in operation. The Mag-No is easily transported about the shop or for use in the field. DAKON TOOL & MACHINE CO., Dept. D, 838 Broadway, New York 3, N. Y., will send descriptive Bulletin No. 100 on request.
INFORM-A-GRAM KEY No. 846-S

SHELDON ACQUIRES VERNON LINE. The Sheldon Machine Co., Inc., builders of Sheldon Precision Lathes and Sheldon Arbor Presses, announce the acquisition of the Vernon line of machine tools. This line includes the well known Vernon Horizontal Milling Machines, illustrated herewith; Vertical Milling Machines and Jig Borers; 12" Back Geared Shapers; and Universal Tool and Cutter Grinders heretofore built and sold by the Machinery Manufacturing Co. of Los Angeles, Calif. All manufacturing of these machine tools has been transferred to the Sheldon plant in Chicago, where production will soon start to permit deliveries shortly after the first of the year. For additional information on Sheldon products, write SHELDON MACHINE CO., INC., Dept. TJ, 4236 N. Knox Ave., Chicago 21, Ill.
INFORM-A-GRAM KEY No. 536-S



A UNIVERSAL COMPOUND ANGLE PLATE for use on milling machines, shapers, planers, jig borers, drill presses, etc., to lay out, machine and check work without removing the work from the plate. It can also be used as a 90 degree angle plate on the machine or on the bench. Because the surface plate may be tilted 90 degrees in two directions and also rotated 360 degrees about the base, the Studler Universal Compound Angle plate will hold work in any position from 0 to 90 degrees in two planes 90 degrees apart and in any position within 360 degrees of the radial axis. Calibration is accomplished through the use of two 5" and one 10" protractors, each graduated in half degrees and each with a vernier graduated to 1 minute, having an accuracy



HALCO

UNIVERSAL HIGH-SPEED MILLING HEAD

For Milling, Drilling, Boring, Counterboring, and Fly-Cutting at any angle.

Featuring feed thru the dove tail slide block.

Insuring greater rigidity, closer tolerances, and longer life.

With micrometer readings in .001 graduations.

Gib adjustable to compensate for wear.

Other important Halco features are these:

No. 3 Morse taper precision ground spindle capable of taking ¾" collet.

Timken taper bearings.

Heavy overarm clamp adjustable to any compound angle.

Total indicated spindle runout .0003.

Delivery from stock on AA-1 MRO priority — No. 3 Morse taper collets from ¼" to ¾" in 1/16ths also from stock.

Guaranteed against mechanical failures for six months.

We also manufacture the Brown & Sharpe type floating tool holders for automatic and hand screw machines.

MANUFACTURING AJAX CORPORATION

Manufacturers of Milling Attachments

2630 ERSKINE STREET, DETROIT 7, MICH.

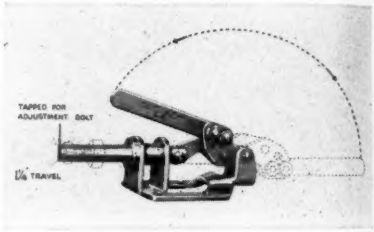
within 10 seconds of the arc. Since each plane has its own locking unit, the 11 x 12 x 1⅛" surface plate may be moved in any plane, leaving the other two planes securely locked in place. The surface plate, which is hand-scraped and is flat to within .0002 of an inch, has forty-eight ⅜-16 tapped holes located 1½" apart for clamping work to the plate and one ¾" reamed hole in line with the radial axis of the plate. The Universal Compound Angle Plate is 8" high, 14½" long, 11½" wide and weighs 155 lbs. A copy of Bulletin No. 4 will be sent by THE ANGLE COMPUTER CO., Dept. T, 5720 Melrose Ave., Los Angeles 38, Calif., on request.

INFORM-A-GRAM KEY No. 100-S

HOT WAX DIPPING TANKS. The new electrically heated tanks developed by the Aeroil Burner Co., Inc., which are capable of melting over 550 lbs. of wax (approx. 70 gal.) in about 75 minutes, have also been found useful in the heating, melting and dripping of plastic strip protective coatings. The unit, available only as a fixed installation, is mounted on sturdy reinforced skids. No plug or cable is supplied as it should be wired directly to a 220-volt AC line. A built-in thermostat with sturdy contactor of special design controls two heavy duty heating elements of 6.5 KW capacity and regulates temperatures automatically from 100° to 550° F. Wax temperatures are quickly checked by a built-in thermometer. This tank, which is 48" long, 20" wide and 15" deep, is equipped with a specially designed "never-freeze" draw-off cock, opening to the inside, to permit drawing off the melted wax. Because both tank and cover are completely insulated, the tank loses an average of only 8° F per hour. An expanded metal tray is provided to protect the heating elements and to support parts of moderate weight. AEROIL BURNER CO., INC., Park Ave. at 57th St., West New York, N. J., will send full particulars.

INFORM-A-GRAM KEY No. 776-S

PUSH AND PULL LOCK CLAMP. A new model has recently been added to Detroit Stamping Company's line of toggle clamps which, it is said, is especially well suited for locating and indexing. This new "Push and Pull" action clamp is known as the De-Sta-Co Model No. 605. The work end of this clamp (plunger rod) is tapped to receive a ⅜"-18, standard threaded bolt, providing quick adjustment to the job at hand. Travel distance



of the plunger rod is 1¼". The clamp is converted from a "push" to a "pull" action, or vice versa, by simply re-locating one of the handle bolts. The clamp weighs but nine ounces, and when in "push", locked position measures 5½" long, 2¼" wide and 2$\frac{11}{16}$" high. When used as a "pull" clamp, in locked position it is 7$\frac{1}{16}$" long, 2¼" wide and 2½" high. DETROIT STAMPING CO., Dept. T, 344 Midland Ave., Detroit 3, Mich., will send descriptive literature on request.

INFORM-A-GRAM KEY No. 165-S

STATIONARY VISES. The four new stationary Rousselle Victory Vises produced by the David J. Ross Co. are, like the swivel base vise, made in four sizes—4½", 7", 10" and 13". Extra heavy bases and ways with extra-strength locking screws give the solidity demanded for heavy work requiring precision. This low, long base locates firmly on the machine table. This vise's resistance to tool pressure and machine vibration makes possible increased accuracy and decreased rejections. It is designed with wide clearances, allowing the use of a wrench in locking up and permitting a saving in set-up time. A cleanout hole in the base of the stationary jaw allows chips and waste accumulation to be removed without loss of time in the "fishing out" process. Both the stationary and swivel models of Rousselle Victory Vise are designed to meet the demand for heavy, accurate

USE 8-POINT PLAN FOR AN OVERBOARD DRIVE IN THE 6TH WAR LOAN!

NOV. 20th to DEC. 16th

Your plant-wide selling of the 6th can do much to lessen the price our fighting men so willingly pay for victory! Join the coast to coast parade of patriotic firms now assuring an "overboard" showing in the 6th by following the 8-Point Plan.

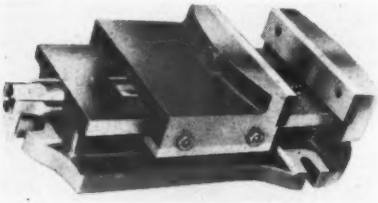
- Appoint a **6th War Loan Bond Committee**, representing labor, management and other groups.
- **Select a Team Captain**—preferably a returned veteran—for every 10 workers.
- Establish a **Quota** for each department—and every employee.
- **Arrange Meetings of Captains**, highlighting importance of their work—effective sales method—and need for detailed study of Treasury Booklet, Getting the Order.
- **Make Assignments** to those best equipped to arrange music, speeches, rallies, competitive progress boards and meeting schedules.
- **Issue Individual Pledge Cards** in name of each worker, providing for cash or installment purchase.
- **Resolicit!** Your State Payroll Chairman has a special Resolicitation Plan for you to put into action near the end of the campaign.
- Give generously of your **Advertising Space** to drive home the War Bond story.

The Treasury Department acknowledges with appreciation the publication of this message by

Staff of the TOOL & DIE JOURNAL

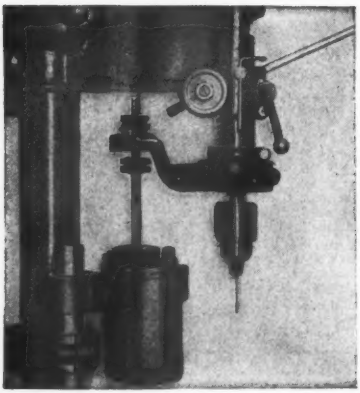
This is an official U. S. Treasury advertisement—prepared under auspices of Treasury Department and War Advertising Council

vises to hold work during milling, grinding, cutting and similar operations. Bulletins on these models are available from DAVID J.



ROSS CO., Dept. TD, Benton Harbor, Mich.
INFORM-A-GRAM KEY No. 160-S

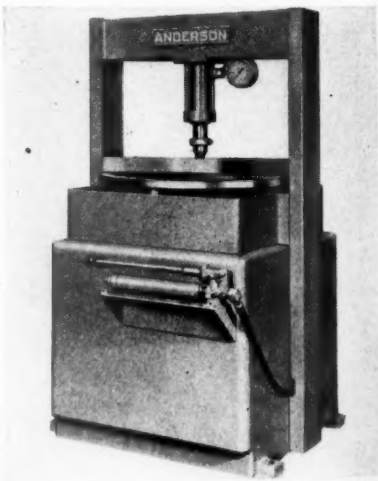
THE COPILOT DRILL PRESS FEED REGULATOR, manufactured by Special Devices Company, is a self-lubricating device that operates on the time tested hydraulic principle. It can be easily and quickly attached to hand feed drill presses. This feed regulator prevents dropping of the spindle when the drill breaks through. All backlash in the spindle



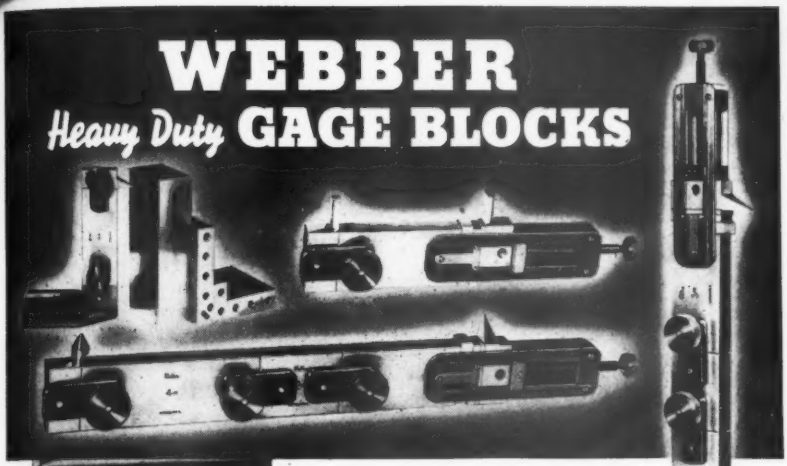
feed mechanism is held back, making it especially valuable in the drill of plastics and thin materials. Free action for chip clearing is allowed and downward motion of the drill is checked before contact is again made with the bottom of the hole. Because the operator merely rests the weight of his arm on the feed lever and lets the Copilot do the rest, fatigue and nervous tension are held to a minimum. Its metering valve automatically clears itself and cannot clog. The Copilot Drill Press Regulator is available in a special model engineered to specific jobs and provides variable regulating characteristics. Write the SPECIAL DEVICES COMPANY, Berlin, Conn., for details.
INFORM-A-GRAM KEY No. C8-S

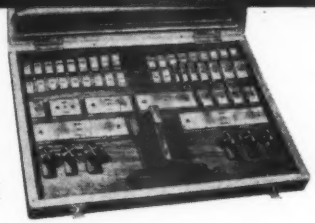
PROFESSIONAL 10" SLIDE RULE. A recent development introduced by the Lawrence Engineering Service of Peru, Ind., is a new polyphase type rule. This rule shows the A, B, C, D, CI and K scales on the front; while the S, L, T scales are on the back of the slide. A recess at the end of the rule has a contact hairline index permitting the use of S, L and T scales without reversing the slide. Markings are clear, easy to read, accurately and finely calibrated on a white face. CI calibrations are in red while the sharp hairline indicator is gunmetal framed. This rule, which is of carefully machined hardwood, retains its accuracy regardless of temperature or humidity. A flexible case and instructions are supplied with every rule. If more information is desired, write LAWRENCE ENGINEERING SERVICE, 517 North Smith St., Peru, Ind.
INFORM-A-GRAM KEY No. C10-S

A NEW HYDRAULIC PRESS for straightening large gear blanks and metal rings has been introduced by ANDERSON BROS. MANUFACTURING CO. of Rockford, Ill. The 30" square table can also be used as a checking plate. An easy-to-read hydraulic gage, calibrated in pounds, indicates the actual pressure on the ram. The press illustrated has a capacity of 20 ton or 40,000 lbs. and is operated as a hand hydraulic pump. Presses with capacities from 10 to 50 ton can also be furnished. The stroke of the ram is 5" and the maximum vertical opening is 8". The floor space is 40" x 40"; net weight is 1500 lbs. Complete details will be sent on request.
INFORM-A-GRAM KEY No. 190-S



WEBBER
Heavy Duty GAGE BLOCKS

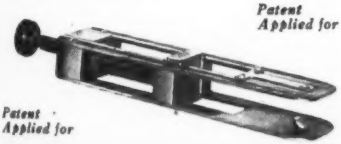




Right — Webber Eccentric Clamp used to unite several blocks quickly into one solid, accurate gage.

Below—Webber Quick Acting Gage Clamp snaps onto the end of any of the long blocks and firmly holds any other blocks necessary to make up the fractions of an inch. Only one of these is required with each set.

Patent Applied for

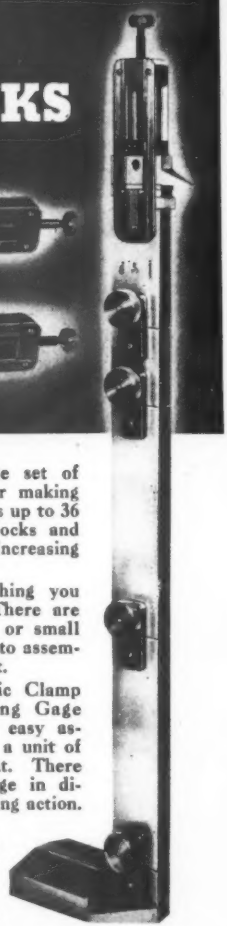


Patent Applied for

● A handy, complete set of blocks and clamps for making precision measurements up to 36 inches. Additional blocks and clamps available for increasing capacity.

With this set everything you need is in the set. There are no loose pins, screws or small parts which take time to assemble and are easily lost.

The Webber Eccentric Clamp and the Quick Acting Gage Clamp permit quick, easy assembly of blocks into a unit of precision measurement. There is positively no change in dimension due to clamping action.

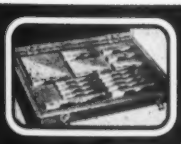


Webber offers two Heavy Duty Gage Sets—

No. 24 Range from .300" to 24.000" in steps of .0001"

No. 36 Range from .300" to 36.000" in steps of .0001"

Write today for bulletin illustrating and describing this compact, useful set of gages for precision measuring.

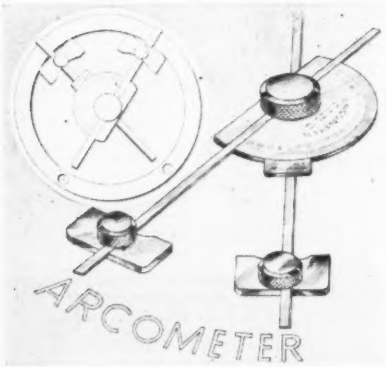


Webber GAGE COMPANY

12903 TRISKETT RD. • CLEVELAND 11, OHIO

A NEW HEAVY-DUTY FORMED WHEEL GRINDING MACHINE for handling either coarse or fine pitch gears with diameters up to 24" has been announced by THE GEAR GRINDING MACHINE CO., Detroit, Mich. This Geargrind Type GG-24-48 takes 48" between centers. The base, which is extremely heavy, provides a low work center line. Work areas are painted spot-light buff, providing better visibility, easier, faster inspection and increased safety for the operator. The index control is such that indexing can function at both ends of the stroke or on the tail stock end only. The index cycle stop is selective from 0 to 400 indexes and may be adjusted at any point in the cycle. The travel of the grinding wheel carriage to the wheel trimming position is automatic and can be made after any predetermined number of cycles, or it may operate as a tooth to tooth index. The motor driven work-head spindle permits checking the work runout with an indicator. This spindle is mounted on precision tapered roller bearings. The piping and the hydraulic pump are located at the rear, enclosed in a removable cover for easy access. Additional data will be sent by the company on request.
INFORM-A-GRAM KEY No. B42-S

THE ARCOMETER. The Peterson Precision Instrument Co. of Chicago has recently announced the availability of the Arcometer, an instrument for measuring arcs along the circular edge (internal or external) of a surface. This instrument has proved to be a time-saver in the layout of bolt holes on flanges, spacing ribs on cylindrical bodies and spacing blades in impellers, etc. In operating the instrument, the corners of the heads are

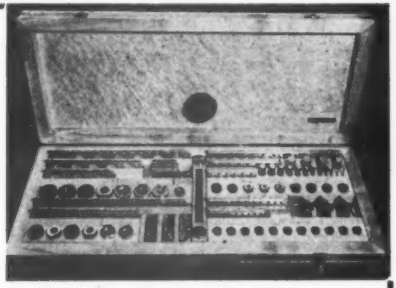


brought against the edge of the work and the arms are rotated to the proper angle where they are locked by a single thumb screw. The reference edges of the arms are then used as scribing edges or for aligning parts, as required. The Arcometer is supplied with 9" bars, suitable for internal diameters of 5¾" to 16" inclusive. Its protractor is equipped with a vernier, thus enabling the user to read the instrument within minutes of a degree. Write PETERSON PRECISION INSTRUMENT CO., Dept. D, 10148 S. State St., Chicago 28, Ill.
INFORM-A-GRAM KEY No. C37-S

NEW RADIUS GRINDING FIXTURE for use on standard tool grinding machines has been developed by the HILL-BARTELT MACHINE CO., Dept. J, 225 S. Church St., Rockford, Ill. The fixture, which is precision built throughout, will profile grind a 180° radius or any lesser arc on the teeth of milling cutters from 3" to 6" diameter and up to 1" thick. The cutter is rotatably clamped on a plate extending from a head which has two micrometer-adjustable cross slides operating at 90°. These permit the cutter to be accurately positioned so that the center of the arc to be ground will fall exactly along the axis on which the head is rotated. A shaft, which is operated by a hand wheel, carries the

head through the desired arc. A scale marked in degrees on the base of the pedestal provides accurate adjustment of the angle at which the tooth is presented to the grinding wheel, thus determining the back-off angle. Indexing is manual, with a conventional adjustable spring finger stop. Visual indication of the amount of head swing is given by an arc scale on the back of the head. A spring pin in the top of the shaft bearing will engage holes in the shaft to fix the cutter in either vertical or horizontal position. Many other grinding operations can be performed either before or after the radius grind and without removing the cutter from the fixture. Write Hill-Bartelt Machine Co. for more information on this new fixture.
INFORM-A-GRAM KEY No. C36-S

Sensational Savings
OF TIME, LABOR, MONEY WITH THE
BORLOCATOR



For manufacturers who require as much tooling as the Aviation Industry—and other mass-producers—the BORLOCATOR is a highly practical answer to the need for "prefabricated" jigs and fixtures.

Here is a highly flexible tooling set up frequently costing less than a single special precision jig or fixture. And it can be set up quickly—and used over and over again.

Location plates can be "matched together" by the locking clamps and screws. The clamps are so designed that as the screws are tightened the clamping action is one of compression —there's no tendency toward a lateral shift. Thus, after the exact positioning of one location plate in relation to another, accuracy of the adjustment is not upset by the final clamping action.

Conclusive evidence is piling up that the BORLOCATOR saves skilled labor time, eliminates errors, contributes importantly to high production with greater accuracy, *and at lower cost!*

MICRO-KING BORLOCATORS are made up in three sets: Model A, angular and flat surface layouts; Model B, circular layouts in hexagon, octagon, and polygon spacing; Model C, box jig attachments. When used in conjunction with Model A, box jig set-ups can be obtained.

HERE ARE A FEW OF THE THOUSAND USES OF THE BORLOCATOR:

- **Spotting old locations quickly**
- **Drilling and reaming holes accurately**
- **A precision layout fixture**
- **As a master plate set up for coordinating drill jigs**
- **For making temporary jigs until production jigs are made up**
- **For drilling sample stampings**
- **As a perforating fixture for metal and plastics materials**
- **As internal and external inspection gage for locating pin centers and bore locations**

MAIL US PRINTS OR SKETCHES FOR YOUR REQUIREMENTS

STEEL TOOLS, INC • **2307 Prospect Avenue Cleveland 15, Ohio**

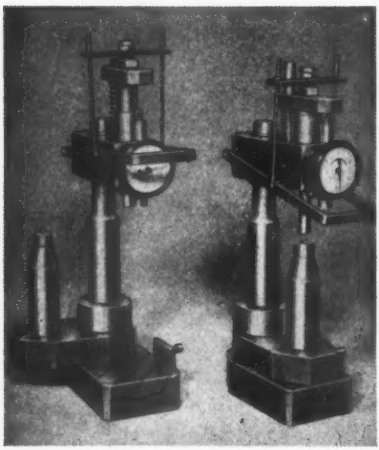
Phone: CHerry 1347

SUN DIAL INDICATOR GAUGES

for . . .
DEPTH, LENGTH,
THICKNESS,
HEIGHT,
LOCATION,
and *Special*
Measurements

DEPTH GAGE

HIGH-SPEED • • ACCURATE • FOOL-PROOF • • DURABLE •



THICKNESS GAGE

This high-speed, durable, and accurate gage enables you to take readings of variations as small as .0001″. Each individual depth and length dimension can be checked visually, and errors determined. No expensive or complicated measuring equipment is required either for checking or setting. A simple master setting gage supplied with each SUN DIAL INDICATOR GAGE provides a quick and dependable method of setting and checking.

These instruments are being used in inspection rooms and on production lines by ordnance manufacturers working for the U. S. Army, Navy and Air Force.

Descriptive folder will be sent you on request—no obligation.

SUN TOOL AND GAUGE CORPORATION
380 Canal Street • New York City

INDUSTRIAL DIGEST

SCIENCE • RESEARCH • METHODS • TOOLING
PRODUCTION • TRADE NEWS AND REPORTS

Foresees Greatest Industrial Building Program in Postwar Period

Contrary to popular belief that the tremendous construction of war plants will halt or make unnecessary extensive postwar building, the effect will be just the opposite, is the prediction of S. M. Rust, Jr., vice president of the Rust Engineering Co., of Pittsburgh, Pa., and Birmingham, Ala.

The huge competitive potentialities of these plants will force industrial management to modernize to the limit and to build many entirely new plants in order to stay in the running, Mr. Rust said, adding that industrial building in large volume will start immediately after war restrictions are relaxed and that in the first three to five years after the war the country will see the greatest volume of industrial construction of any similar peacetime period.

The thousands of inquiries and orders for designs of new plants and alterations of existing plants which are being received by engineering firms throughout the country provide a solid, factual basis for his assertions.

The type of designs most usually sought are "master plans"—not for single structures—but covering all the building and development contemplated by the firms concerned for five years or more. Major factors in most future planning, according to Mr. Rust, are:

(1) "One hundred percent continuous, assembly line type production, machine-operated to the fullest extent. In pre-war years, less than 50% of industry produced on such a basis.

(2) "Standardization of products to a hitherto unimagined extent, both for industrial use and the public. One of the most significant postwar trends, standardization will cut costs throughout industry.

"This is not theorizing. The plans are already on engineering drawing boards. We have had requests for streamlined, standardized-product plant designs for everything from machine tool metals, to house furniture, to steel caskets. Scientifically designed mass production is being projected in every conceivable field.

"New automatic machinery will improve almost all processes, and greatly alter some by the elimination of handwork. Improved working conditions will increase output. These will include air conditioning, automatic dust removal, improved lighting, maximum cleanliness and sound-proofing."

Measures Material Porosities

A patent for an apparatus which can determine the relative porosities of materials has just been issued to Stuart H. Hahn and Robert H. Judson and assigned to B. F. Goodrich Company, Akron. Porosity is tested by the degree of vacuum in a chamber which is an important part of the apparatus.

Chief object of the invention is to provide the mechanism for determining the relative porosities of various materials by drawing air or gasses through the material and indicating the rate of flow. The apparatus was originally designed for testing the porosity of sponge rubber, but it has many other applications, the company believes.

So small and compact that it can easily be lifted and transported with one hand, the apparatus consists of a

vacuum chamber placed in contact with the material to be tested, a constant speed power driven fan for evacuating air from the vacuum chamber, an outlet port for emitting the air, and a pressure gauge to measure the degree of partial vacuum in the chamber and indicating this on a fixed scale. An arm, connected with the manually operated switch which starts and stops the fan, forces and holds the measuring indicator in position when the switch is turned off.

The scale used with the apparatus is adhered to a piece of translucent plastic and is reproduced on a transparent piece of photographic film, with a lamp placed behind the printed scale so that the degree of porosity can be easily read.

With highly porous material, the vacuum created by operation of the apparatus will be slight, and this vacuum increases as the porosity decreases. The scale used with the apparatus may be graduated in absolute units or be made to show relative porosities of two or more pieces of material. Because of its portability the apparatus can be valuable as a demonstration device.

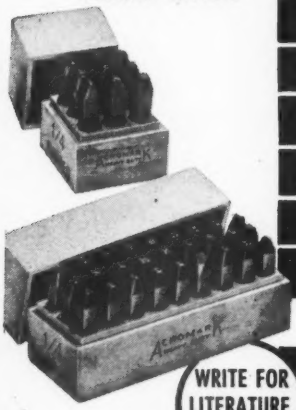
Veteran Entitled to Supplementary Apprentice-Training Wages

Wages earned by veterans who qualify for apprentice training will be supplemented by the monthly allowances provided by the "G. I. Bill of Rights," it was announced recently by the War Manpower Commission in a report of the Apprentice-Training Service of WMC. The report stressed advantages of such payments to veterans wishing to build up their earnings during the initial years of industrial training.

The G. I. Bill of Rights authorizes the Veterans' Administration to supplement the veteran apprentice's wage with a subsistence allowance of $50 to $75 per month, depending on whether he has dependents. The combined earnings may not exceed regular wages in the trade for which he is training, however.

There are more than 100 skilled occupations in manufacturing and construction industries for which men are trained through apprenticeship. More veterans are expected to apply for training in the building and automotive trades, which will be on the rebound after the war, WMC said.

THE TOUGHEST STAMP MADE

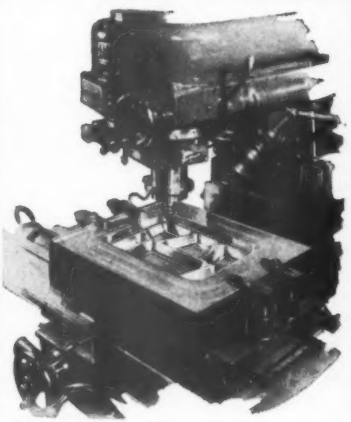


ACROMARK HEAVY-DUTY GRADE B STEEL LETTERS AND FIGURES ARE USED WHEREVER QUALITY DURABILITY AND DEPENDABILITY ARE ESSENTIAL IN MARKING FOR STEEL MILL, MACHINE SHOP AND MANUFACTURING APPLICATIONS

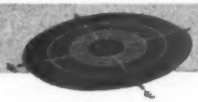
WRITE FOR LITERATURE TODAY

ACROMARK
MARKING AND STAMPING SPECIALISTS
5-15 Morrell Street, Elizabeth, N. J.

How would you handle this Job in your Shop?



Photos — Courtesy Eclipse Molded Products Company



1001-P

Molds for plastics pose some tough milling problems occasionally. Here's a tray mold—that could have been difficult, but it was completed on a Milwaukee Rotary Head Milling Machine with typical speed, economy, and accuracy.

Read this job report —

TRAY MOLD

CAVITY SIZE — width, 12 inches, length, 15½ inches, depth, 1½ inches.

Time required for milling both mold halves complete — 219 hours.

All form cutters milled to correct size and shape on the Milwaukee Rotary Head Milling Machine.

Check these advantages of the Milwaukee Rotary Head Milling Machine and how you can benefit from them in your own shop:

DIRECT... mills mold cavities in a single set-up without the aid of templets or models.

ACCURATE... chances for error are eliminated because there is no change in set-up. Exact control of all combinations of cutting movements — possible only with this machine — transmits mathematical precision to the work.

FAST . . . initial job preparation and set-up time is reduced to the minimum. Accurate performance of the machine saves operator's time and rapid production of intricate molds and dies is the result.

Write for Bulletin No. 1002C and complete information.

BUILDERS OF MILWAUKEE ROTARY HEAD MILLING MACHINE • FACE MILL GRINDER • AUTOMETRIC JIG BORER • SPEEDMILL • MIDGETMILL • CENTER SCOPE.

KEARNEY & TRECKER

Products

CORPORATION

Milwaukee 14, Wisconsin

Subsidiary of Kearney & Trecker Corporation

To date, about 600 veterans have taken advantage of apprentice training, but an increasing number are being enrolled and as many as 200,000 veterans may eventually apply, WMC said. Fewer than 100 of the veterans now enrolled have applied for and are receiving the monthly allowance.

One of the reasons advanced by the Veterans' Employment Service of WMC for the small number of veterans thus far taking advantage of the training offered is the many jobs open in war industry that veterans are filling through USES referral. At the end of hostilities, however, when there are large-scale cutbacks in war plants, it is expected that more and more veterans will enter apprentice training.

Apprenticeship programs, based on standards developed by the Federal Committee on Apprenticeship, specify the number of hours of work on the job and in classroom attendance, wages paid during each step of the training, schedule of operations to be learned on the job, a method for keeping records of the apprentice's progress, periodic examinations and adequate job instruction and supervision.

To date, apprenticeship programs have been established in more than 30,000 manufacturing plants, construction and miscellaneous industries.

There is a veterans' employment service representative in every USES office who assists veterans wishing to learn a skilled trade by advising them where there are the most likely opportunities for an apprenticeship in the trade best suited to their capabilities.

Timken Canadian Plant

St. Thomas, Ontario, will be the site of a new bearing and rock bit plant to be operated by The Timken Roller Bearing Company, Limited, Canadian subsidiary of The Timken Roller Bearing Company of Canton, Ohio.

Choice of St. Thomas as a home for the new plant was made because of its ideal transportation facilities and its central location among Canadian mar-

In War, as in Peace...

CERRO ALLOYS

SAVE TIME and CUT COSTS!

CERROMATRIX (Melting Temp. 250° F.) For securing punch and die parts, anchoring machine parts without expensive drive fits, short run forming dies and other metal-working applications.

CERROBEND (Melting Temp. 158° F.) Used as a filler in bending thin-walled tubing to small radii. Easily removed in boiling water. Also used for aircraft assembly jigs, templates for forming dies and other purposes.

CERROSAFE (Melting Temp. 190° F.) Used to accurately proof-cast cavities such as molds, gun chambers, forging dies, etc. and for many similar applications.

REPRESENTATIVES AND DISTRIBUTORS

Brklyn., N. Y., Belmt. Smelt. & Ref. Wks.
Ansonia, Conn., Jackson Associates
Boston, Mass., Jackson Associates
Philadelphia, Pa., Castaloy Metal Sales Co.
Cleveland, Ohio, Die Supply Co.
Detroit, Mich., Castaloy Metal Sales Co.
Chicago, Ill., Sterling Products Co., Inc.
Moline, Ill., Sterling Products Co., Inc.
Milwaukee, Wis., Harry C. Kettleson, Inc.
Minneapolis, Minn., Northern Machinery & Supply Co.
St. Louis, Mo., Metal Goods Corporation
Kansas City, Mo., Metal Goods Corporation
New Orleans, La., Metal Goods Corporation
Dallas, Tex., Metal Goods Corporation
Houston, Tex., Metal Goods Corporation
Tulsa, Okla., Metal Goods Corp.
Los Ang., Cal., Castaloy Metal Sales Co.
Montreal, Can., Dominion Merchants, Ltd.
London, Eng., Min. & Chem. Prod., Ltd.

CERRO DE PASCO COPPER CORPORATION

40 WALL STREET - - - - NEW YORK 5, N. Y.

HOW TO GET THREAD MILLING CUTTERS *Faster*

Order by

STOCK BLANK NUMBER

giving Pitch and Thread Form desired

•

DETROIT

STANDARD STOCK BLANKS MEET 90% OF ALL THREAD MILLING CUTTER REQUIREMENTS

FOR STANDARD STOCK SIZES, ASK FOR BULLETIN No. CB-43

BUY U.S. BONDS STAMPS

DETROIT TAP & TOOL CO.

8432 BUTLER
DETROIT 11
MICH. U.S.A.

kets for Timken products according to William E. Umstattd, president. Increased Canadian demand for Timken Roller Bearings in the automotive, railroad, agricultural, logging, mining, metalworking and paper industries; as well as a growing demand for Timken Removable Rock Bits for mining and general contracting work, led to the decision to open a Canadian plant.

Guide to Federal Agencies

Designed to provide interested citizens with enough accurate information to launch them into consideration of what Government should do and how it should operate after V-Day, a booklet, "descriptive tabulation of 428 functional units of the Federal government," has been published by the Citizens National Committee, Inc., of Washington, D. C.

Called "Federal Agencies," the publication comes close to being a Federal government guide book. It gives the names, a description of the function, the method of creation, and the appropriation and estimated average personnel for each of the agencies listed as of June 30, 1944.

An elaborate cross-indexing of all listings is provided, giving official names and a listing by the key word in each name. This facilitates locating a unit whether it is one of the 34 "bureaus," 46 "offices of", or 42 "national's". Copies of the booklet are available at 25¢ per copy from the Citizens National Committee, Inc., 1409 L St., N. W., Washington, D. C.

War Film Booklet

A new booklet issued jointly by the Army and Navy entitled "War Films For War Workers" is devoted to illustrating the methods being used successfully today in showing special battle-front films to thousands of war plants and labor unions throughout the country. Photographs of actual

IMPROVED TAPPING HEAD

Cross section of Tru-Grip Tap Holder showing positive drive to tap.

BETTER DESIGN GIVES — ● Increased Output ● More Accurate Work ● Less Tap Breakage

The Tru-Grip Tap Holder, for instance, weighs one-third as much as conventional chucks, which kills fly wheel effect and promotes more accurate tapping. The tap holders have small outside diameter: ¾" for No. 1, 1" for No. 2, 1⅜" for No. 3—which permits use of tapping head in hard-to-get-at spots. Shank is one piece, heat treated and precision ground. Tap is driven by square and held true by the round. Many other features include: Dry, double-cone friction clutch that won't wear and can't absorb oil; makes bottom tapping easy; ball bearings; three point balanced, heat-treated gear reversing mechanism which distributes pull and greatly reduces strain.

SEND ME BULLETINS ON:

PROCUNIER SAFETY CHUCK CO.

12-14 S. Clinton Street
Chicago, Ill.

☐ High Speed Tapping Heads
☐ Tru-Grip Tap Holders
☐ Universal Tapping Machines

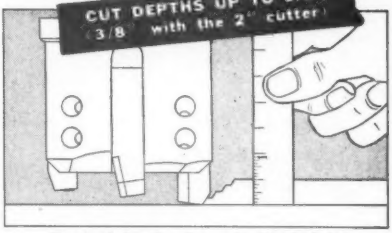
Name.....

Address.....

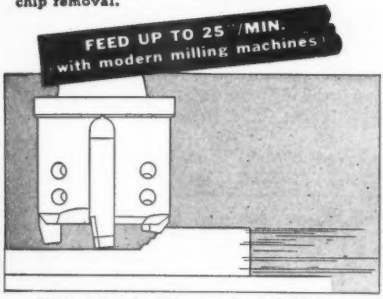
KENNAMILL STEP-CUTTERS

A Simplified Means To Multiply Milling Production with Available Equipment

Kennamills are inserted blade fly-cutters that, in most cases, enable available horsepower to be fully utilized in chip removal.

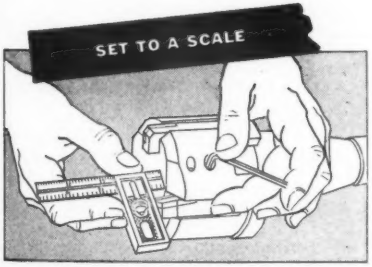


Desired depth of cut is divided into equal steps.



High rates of milling made possible on all commonly used steels.

Blades are resharpened to template on ordinary carbide tool grinder.



Grinding in the head is unnecessary.

Kennamills bring the advantages of high-production carbide milling of steel to every shop that has milling machines of reasonably recent manufacture. They are inexpensive, easy to set-up, and a cinch to maintain. Get in step with modern carbide milling by using this simplified method — write today for catalog information on Kennamills.

KENNAMETAL
SUPERIOR CEMENTED CARBIDES
KENNAMETAL — LATROBE, PA.

showings given in stock rooms, cafeterias, meeting rooms, and other facilities of war plants illustrate how these locations can be adapted for showings through a few simple devices.

The Industrial Services Division of the U. S. Army, and the Industrial Incentive Division, U. S. Navy, which produced the booklet, have included information on how Army and Navy films may be obtained for industrial showings. Copies of the booklet may be obtained by writing to the Chief of the Industrial Incentive Division, Navy Dept., 2118 Massachusetts Avenue, Washington 25, D. C.

Machine Tool Shipments for October Up 3.4%

Machine tool shipments by 199 firms which report to WPB increased 3.4% in October—an increase of $1,224,000 over September valuations, the Tools Division of the War Production Board announced recently in releasing preliminary figures on tool statistics.

Net new firm orders (total orders less cancellations) received by the firms totalled $56,521,000, an increase of $23,369,000 or 70.5% over September's figures. The backlog of unfilled orders increased to $213,392,000 in October, or 9.9% over September. About $25,716,400 of this backlog is represented by unrated orders. At the present rate of shipments, approximately six months will be required to fill orders on hand as at the end of October, WPB said.

Machine tool orders were increased by 4,400 units during October, over September, the Tools Division added. Recent removal of the rating floor in Order E-1-b has made possible the entering of unrated orders which will be shipped in such manner as not to interfere with delivery of rated orders for similar equipment on required dates. First shipments of unrated orders made in September amounted to $24,100 and October unrated shipments amounted to $421,000, a Division official stated.

A new plan by which prospective pur-

DRILL JIG BUSHINGS

That Insure Precision Work...Eliminate Guesswork!

PRECISION GROUND

A. S. A. STANDARD

IMMEDIATE DELIVERY

SIMPLIFIED ORDERING

Specify (a) Drill Size, (b) O.D., (c) Length, in the order named, also the symbol for the type of bushing required.

FOR EXAMPLE—

- "P—¼ x 13/32 x ¾" would mean "Press Fit bushing .2501 —.2504 I. D. x .4075 — .4078 O. D. x ¾ long."
- "S. R. — 11/32 x ¾ x ½" would mean "Slip Renewable bushing .3438 — .3442 I. D. x .7498 — .7500 O. D. x ½" body length."

SPECIAL BUSHINGS

All types of precision bushings made to order. Steel or non-ferrous metals. Close tolerances up to .0001".

Write for Literature

ACME TOOL CO.

196 CHURCH STREET • NEW YORK 13, N. Y.

IT'S NEW!

SEND FOR YOUR COPY

THIS new Peerless Bulletin MC-51 fully describes the new Mechani-Cut. It is a precision-made, mechanically-driven metal cutting saw that sets new standards — in fast sawing, modern design, low maintenance and dollar-for-dollar value. Available in three popular sizes — 7″ x 7″ . . . 11″ x 11″ . . . and 14″ x 14″.

Four-Sided Saw-Frame Finger-Tip Pressure Control

The new Mechani-Cut has the patented Peerless Four-Sided Saw-Frame that surrounds the blade and the work. Backing-Plate Blade-Support, locked 1/32″ above blade, permits maximum blade pressure, assures positive lift clear across on the non-cutting stroke and maximum blade life. New Compensating Feed Unit permits adjusting cutting pressure to the fraction of a pound. The coupon will reserve your copy of the New Bulletin MC-51.

PEERLESS
MACHINE COMPANY
RACINE · WISCONSIN

☐ Send Copy of New Bulletin MC-51
Also send bulletins on
☐ Peerless Hydra-Cut Saws
☐ Peerless Vertical Saws
☐ Peerless Blades, Stock Rests & Coolant.

Dept. TD-1244
Company_____
Individual_____
Street_____ City_____ State_____

Treasury Lists Surplus Property For Sale

chasers of surplus commodities from Treasury's Office of Surplus Property will be advised of items for sale through the Treasury's 11 Regional Offices has been put into effect. No longer will it be necessary for persons to contact regional offices, because information on available goods will be listed in the Treasury's "Surplus Reporter," to be sent out periodically.

First editions of the "Surplus Reporter" were issued late in November. They are for the Hardware and General Products classifications. Ten days later, the editions devoted to Furniture and Medical Supplies were issued. At intervals of ten days additional editions will be published until the following divisions are covered. These are: Furniture, Hardware, Machinery, Automotive, Textiles and Wearing Apparel, Medical and Surgical, and General Products.

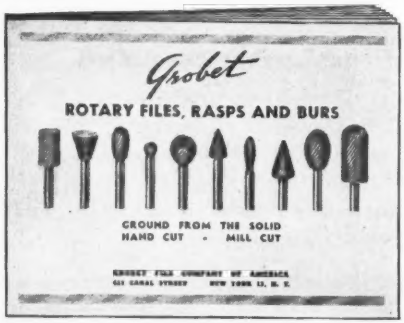
The "Surplus Reporter" is to be issued from each regional office at regular intervals. This will advise firms on Treasury's mailing list what the Treasury has to sell, the area in which material is located and the general method which will be used to sell it. Information on available goods nation-wide will be listed by each regional office.

Purchasers will contact the regional office and indicate the items in which they are interested. If disposition is to be made by invitation to bid, forms will be sent. If sale is to be made by fixed price, negotiations or otherwise the prospective purchaser will be so advised.

The new system will mean the end of the practice of automatically sending invitations to bid. In the future, those interested will request invitations on specific items after they have received notice through the "Surplus Reporter" of what is available. The new plan will cut down enormously the amount of paper and manpower consumed in the process of disposing of surplus and at the same time, furnish more complete information on things to sell.

Treasury's Office of Surplus Property

SEND FOR NEW CATALOG YR

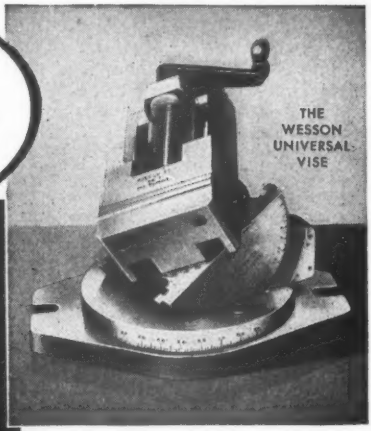


• *Just off the press*—the most complete of its kind, illustrating the full line of GROBET ROTARY FILES, CUTTERS, DIESINKER'S BURS, etc., in size, shape and coarseness of cut for every industrial purpose.

(Please make your request for "Catalog YR" on your firm letterhead)

GROBET FILE CO. of AMERICA
421 Canal Street — New York 13, N. Y.
1812 F. L. GROBET
IMPORTERS OF GROBET SWISS FILES — MFRS. OF GROBET ROTARY FILES
PLANTS: NEW YORK, CHICAGO, LOS ANGELES

WESSON VISE
makes ANY operator an EXPERT



Don't let those "manpower blues" get you down when you have precision angle milling to do! Remember . . . WESSON Vises are immediately available. You can get *them* on the job, fast! And *any* operator can do expert precision angle milling, drilling, grinding, reaming, slotting, or what have you... with WESSON Universal Vises. Rugged and rigid, free from "chatter," these vises permit high speed precision-production or tool room service, and save time and money.

Difficult angle set-ups can be made quickly . . . in a fraction of the time ordinarily required. Compact size, lowest overall height, ability to work in close quarters, and wide range of capacity permit many adaptations to standard machines . . . you multiply the uses of machine tools with WESSON Vises. Two sizes. See nearest distributor, or write for bulletin . . . WESSON PRODUCTS CO., 719 Fisher Bldg., Detroit 2, Michigan.

WESSON *Universal* VISES
BUILT TO WESSON STANDARDS OF QUALITY AND PRECISION

WESSON PRODUCTS CO., Dept. TD-12
710 Fisher Bldg., Detroit 2, Michigan

Please send me illustrated bulletin of WESSON Universal VISES and ANGLE PLATES.

Name and Title.....

Firm Name.....

Address..... City & State.....

stated that the Washington office of Surplus Property will hereafter act as a policy, pricing and directional staff. Sales will be made from Regional Offices in each of which there are 8 commodity departments similar to those in Washington. In charge of each of these Regional Departments will be a marketing specialist, who is a seasoned business man, familiar with trade practices in his particular field. Treasury's 11 Regional Offices of Surplus Property and the states they comprise are:

REGION I—Connecticut, Maine, Massachusetts, New Hampshire, Vermont, Rhode Island. Regional Office: Park Square Bldg., Boston, Mass.

REGION II—New York, Pennsylvania, New Jersey. Regional Office: Empire State Bldg., 61st Floor, New York, N. Y.

REGION III—District of Columbia, Delaware, Maryland, North Carolina, Virginia. Regional Office: 1126 21st St., N. W., Washington, D. C.

REGION IV—Ohio, Indiana, Kentucky, West Virginia. Regional Office: Commercial Arts Bldg., 704 Race St., Cincinnati, Ohio.

REGION V—Illinois, Michigan, Minnesota, North Dakota, South Dakota, Wisconsin. Regional Office: 209 LaSalle St., Chicago, Ill.

REGION VI—Alabama, Florida, Georgia, Mississippi, South Carolina, Tennessee. Regional Office: Belle Isle Bldg., Atlanta, Ga.

REGION VII—Arkansas, Louisiana, Oklahoma, Texas. Regional Office: 609 Neil Anderson Bldg., Fort Worth, Texas.

REGION VIII—Iowa, Kansas, Missouri, Nebraska. Regional Office: 2605 Walnut St., Kansas City, Mo.

REGION IX—New Mexico, Colorado, Utah, Wyoming. Regional Office: 7th Floor, Exchange Bldg., 1030 15th St., Denver, Colo.

REGION X—Arizona, California, Nevada. Regional Office: 30 Van Ness Avenue, San Francisco, Calif.

REGION XI—Idaho, Oregon, Montana, Washington. Regional Office: 2005 Fifth Ave., Seattle, Wash.

Airplane wings fabricated entirely of

EXTRA STRENGTH
Can Save
Time and Labor

When three screws can do the work of four, five or more, they save drilling, tapping and assembling time and labor. They speed production and cut costs.

Mac-It Hexagon Head Cap Screws are heat-treated for maximum strength and toughness. This extra strength can be used to provide ample holding power with fewer screws.

The Mac-It "m" on the hex head is your guarantee of quality. It appears on all diameters ¼" to ¾", inclusive.

OTHER MAC-IT PRODUCTS INCLUDE:
Hexagon Socket Cap Screws, Hollow Set Screws
Hollow Pipe Plugs, Stripper Bolts
Square Head Set Screws

Mac-its
PRONOUNCED "MACK-IT"

Strong, Carlisle & Hammond Company • Cleveland, Ohio

Heat Treat Your Own Small Parts...

SAVE TIME AND MONEY THESE 5 DIFFERENT WAYS

This small compact electric furnace is inexpensive, handy and easy to operate—ideal for small tool and die shops—saves time these five different ways:

1. Eliminates delays in sending small machine parts out to overcrowded commercial heat treaters.
2. Saves time and expense of drawing or tempering small metal parts in large furnaces.
3. Cuts handling time when normalizing or annealing small parts. No waiting.
4. Conveniently available for pre-heating for subsequent high-speed hardening.
5. Eliminates shut downs and delays in servicing emergency repair orders.

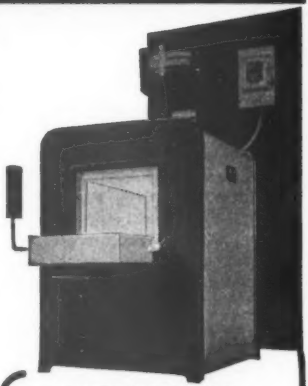
AVAILABLE IN TWO SIZES

Type	*Chamber Capacity*	*Amps 115 V*	*Watts*	*Amps 230 V*	*Price*
MH-3	8″W 6″H 14″L	29.6	3400	14.8	$124.00*
MH-4	10″W 6″H 18″L	....	4800	20.9	$191.00*

**Includes Hearth Plate*

MAX. SAFE TEMPERATURE—Continuous operation, 1750° F.; Intermittent operation, 1850° F.

AUTOMATIC CONTROL—Indicating Controlling Pyrometer—Thermo-couple and lead wire complete—$152.40.



REPLACEABLE HEATING ELEMENTS

Replaceable nickel chromium resistors embedded in rectangular refractory blocks. Elements form inner walls of furnace chamber, and may be replaced easily and quickly after removing rear panel — furnace structure remains undisturbed.

FREE—Complete data covering specifications, additional applications and ordering instructions are included in this new folder. Write for your copy today. Ask for Bulletin No. 50.

COOLEY ELECTRIC MANUFACTURING CORP.
32 SOUTH SHELBY STREET · INDIANAPOLIS 7, IND.

Magnesium Wings Forecast All-Magnesium Planes

magnesium have been in flightformore than a year on navy training planes, it was revealed recently by J. C. Mathes, of the Dow Chemical Company, speaking before the 65th annual meeting of the American Society of Mechanical Engineers.

"While the use of magnesium alloys in aircraft has increased during the war to the extent that the average fighting plane now utilizes approximately half a ton of this light metal, the use of all-magnesium structures represents a new departure in aircraft design," Mr. Mathes said. "I am convinced that our success with these wings foreshadows all-magnesium airplanes in the very near future."

Since magnesium is one-third lighter than aluminum, he pointed out, such planes would be notably lighter than present types, a factor which would do much in making air transportation more economical. "If we can save a few hundred pounds in plane weight we can carry that many more pounds of pay load with no increase in operating costs," Mathes said. "The saving of a single pound has been estimated as worth $100 a year on a commercial plane."

The speaker revealed that his company has been working on the magnesium wing project, in cooperation with the Navy department and Bureau of Aeronautics since 1940, the original set of wings being designed for the Navy's SNJ-2 advanced trainer built by North American Aircraft Company. After static tests and certain minor changes in design in 1942, 30 sets of the wings were ordered. "These wings have now been in regular service at naval air training stations since early in 1943, and have proven entirely satisfactory," Mr. Mathes said, "and many of the pilots have expressed themselves as of the opinion that the magnesium wings impart better flying characteristics to the plane."

DON'T GUESS...

Be Accurate with ACME DRILL JIG BUSHINGS

There's no guesswork when your jigs are equipped with Acme Bushings. On the contrary, accurate drilling is assured, because drill jig bushings from Acme are produced by specialists in precision manufacture.

Acme offers two complete bushing standards, the A.S.A., *plus* the Acme standard line. Because of this you may be enabled to eliminate many special bushing requirements to save time and money.

You are invited to write for details on Acme's complete line of products and services offered to the precision working field.

ACME INDUSTRIAL COMPANY

Makers of Standardized Jig and Fixture Bushings

206 N. Laflin St. Chicago 7, Ill. MONroe 4122

EXPERIENCE CAPTURED IN STEEL

Watchmakers once were the ultimate in skilled mechanics. Today, in hundreds of machine shops all over America, men produce parts as small and as accurate as any watch parts and produce these parts in great quantity to uniform accuracy.

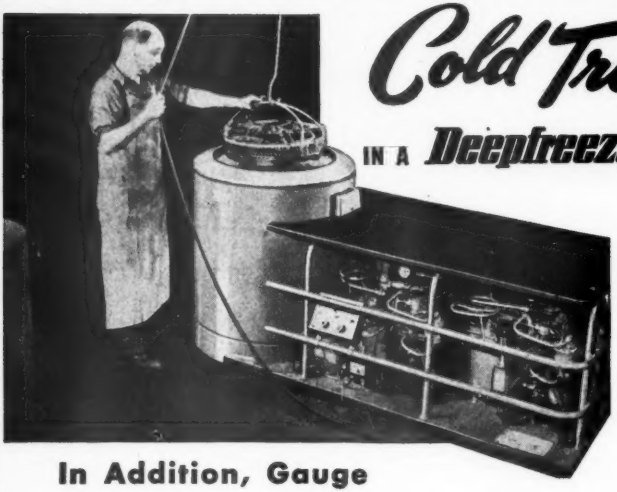
Uniform, mass production of high precision parts is made possible by the use of simple yet extremely precise small hand gages. **VARD** makes these gages and carries in stock, ready for shipment on order, numbers of gage members and handles in thread sizes from 0-80 NF to 1½ in. NC. Cylindrical gages are always made to order. Tapered pipe thread plug gages in sizes of 1/16 in. to 2 in. inside pipe diameter are carried in stock.

VARD *stands for* **Verity · Accuracy · Responsibility · Durability**

VARD makes on order all types of cylindrical, taper and thread gages in standard or special thread forms.

VARD INC.
PASADENA 8, CALIFORNIA

Gauge Growth Eliminated after



Cold Treating

IN A *Deepfreeze* INDUSTRIAL CHILLING MACHINE

In Addition, Gauge Life Lengthened as a Result of Increased Metal Hardness

Here is a typical example of how manufacturers are using cold treating to stabilize gauges and other precision machine parts. Under conventional production methods these "H" type pin gauges grew as much as .001" to .0015" while stored in tool cribs. To remedy this, gauges were subjected to the following procedure in a Deepfreeze −120° F. Industrial Chilling Machine:

(1) Heat to 1450° F.; (2) water quenched; (3) immersed in water approximately 210° F. for 1½ hours; (4) return to room temperature; (5) transfer to Deepfreeze at −120° F. for 1½ hours; (6) return to room temperature; (7) given a draw of 375° F. for 1½ hours; (8) cooled to room temperature; (9) return to Deepfreeze for 1½ hours; (10) return to room temperature; (11) immersed in hot water at 210° F. for 1½ hours; (12) return to room temperature; (13) again cold treated in Deepfreeze at −120° F. for 1½ hours; (14) return to room temperature; (15) finished ground to size.

Gauges were checked for size immediately after cold treatment, two months later, and again four months later. Results—growth held to .00004" as compared to former .0015". Metal hardness was also improved as a result of this treatment.

***FREE* . . . LATEST COLD TREATING INFORMATION . . .** Get the complete history of cold treating in this new 40-page booklet. Learn how leading manufacturers are applying it to their production. Write for Bulletin No. 1-4.

Only Motor Products can make a "Deepfreeze"

Deepfreeze

2307 DAVIS STREET
NORTH CHICAGO, ILLINOIS

TRADE MARK DEEPFREEZE REGISTERED UNITED STATES PATENT OFFICE
Industrial Chilling Equipment for Stabilizing, Testing, Processing and Stabilizing Metals

Division of Motor Products Corporation, Detroit

PUBLICATION PREVIEWS

Keep Informed!
CATALOGS
BULLETINS
SPECIFICATIONS

Use our postage-free Inform-a-Gram for your request

TOOL STEEL WELDING catalog containing 40 pages of illustrated descriptions has recently been published by WELDING EQUIPMENT & SUPPLY CO., Dept. D, 223 Leib St., Detroit 7, Mich. Their Eureka tool and die welding electrodes are used for repairing existing units that fail in operation; for creating

cutting edges or working areas in the composite fabrication of units using mild, medium, high carbon or S.A.E. steel as a base; for correcting design by facilitating changes in contours, corners or edges during die "try-out" or "change-over" programs; and for rectifying errors made in manufacturing thus eliminating conventional inserts.
INFORM-A-GRAM KEY No. 580-S

RADIUS DRESSER CATALOG INSERT for their special high-speed steel cutting tool catalog published by U. S. TOOL & MANUFACTURING CO., Dept. T, 6906 Kingsley, Dearborn, Mich., describes two new models of radius dressers. Model 45 is adaptable to all radii up to and including 4½" and can be used for concave or convex dressing. Model 124 is an angle correcting radius dresser (maximum radius 1⅛") and is designed for correcting radius on a wheel for grinding compound and compound complex forms on flat form tools, etc. Those having the company's general catalog should so state, because this new 4-page insert will then be furnished punched for inserting in the general catalog as a separate and additional section.
INFORM-A-GRAM KEY No. 812-S

EXTERNAL GRINDER possessing 452 sq. in. of hand scraped bearing surfaces is illustrated in a circular released by H. LEACH MACHINERY CO., Dept. D, 387 Charles St., Providence 4, R. I. The work spindle is mounted on two precision roller bearings. It has six table speeds and a micrometer adjusted tail stock with spring action.
INFORM-A-GRAM KEY No. 801-S

"DIE-LESS" DUPLICATING—The Di-Acro System of metal duplicating without dies is described in Catalog No. 44-6 published by O'NEIL-IRWIN MFG. CO., Dept. T, Minneapolis 15, Minn. Women workers can be quickly trained to learn this new industrial technique made possible by the extreme accuracy, adaptability, and ease of operation of Di-Acro Precision Machines—Benders, Brakes, Shears—especially when used as a continuous integrated production process. This process can be converted to post-war manufacturing of peacetime products without any expense or time loss.
INFORM-A-GRAM KEY No. 20-S

"SPRINGS DESIGNED FOR THE JOB IMPROVE PRODUCT PERFORMANCE" is the title of a two-color booklet describing the four factors essential to correctly designing a spring for any application. The five basic types of springs are each illustrated and defined, and wide varieties of the many shapes and sizes into which these five types may be designed are shown. Covered in detail are twelve of the commonly used spring materials with descriptions of their characteristics. Copies of this new booklet are available from the

MUEHLHAUSEN SPRING CORP., Dept. T, 875 Michigan Ave., Logansport, Ind.
INFORM-A-GRAM KEY No. 751-S

JOHANSSON GAGE BLOCKS are featured in a folder issued by the FORD MOTOR CO., Johansson Div., Dept. T, Dearborn, Mich. Illustrations demonstrating a few of the many functions of Johansson Gage Set No. 2 when used with accessories are shown. This set consists of 35 blocks that will make 80,000 different size gages in steps of .0001″, from minimum size .300″ to more than 8″.
INFORM-A-GRAM KEY No. C25-S

KNOCK-OUT UNIVERSAL TOOL GRINDER is described and illustrated in a 16-page catalog published by the K. O. LEE CO., Dept. J, Aberdeen, S. Dakota. Numerous photographs show the Universal Grinder at work in the tool room and on the production line. Feed screw nuts on vertical and cross-feeds are self-aligning, self-cleaning, adjustable for wear and hardened for long life.
INFORM-A-GRAM KEY No. 361-S

PNEUMATIC MOTOR DRIVEN FORGING HAMMER is illustrated and described in Bulletin No. 1275 issued by the CHAMBERSBURG ENGINEERING CO., Dept. T, Chambersburg, Pa. This self-contained type Pneumatic Hammer has a compressor piston cylinder and ram cylinder in which a compressor piston and a ram operate. Added to the advantage of more powerful blows is that of greater rapidity of blows, which permits working the forging at higher temperatures.
INFORM-A-GRAM KEY No. 671-S

ARTUS PLASTIC SHIMS for adjusting Timken Roller Bearings are described in a folder published by INDUSTRIAL PRODUCTS SUPPLIERS, Dept. D, 2 Broadway, New York 4, N. Y. These shims are approved by the Timken Roller Bearing Company for all applications where temperatures do not exceed 175° F. They are impervious to oils and greases and maintain the same even thickness under most normal operating conditions.
INFORM-A-GRAM KEY No. 594-S

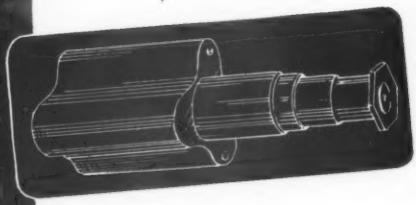
SENSORY TORQUE WRENCH which provides for reflex torquing is described in a bulletin available from the P. A. STURTEVANT CO., Dept. T, Addison, Ill. This "faster than thought" wrench, reported to be the culmination of seven years of extensive research, will stand all ordinary shop abuse and yet remain dead accurate.
INFORM-A-GRAM KEY No. 479-S

DE-BURRING OPERATIONS can now be easily handled by "green" trainees by using the Nobur, an efficient, simple tool that removes the burrs or sharp projections surrounding drilled, reamed or bored holes. Instructions

ROTO-SINE
TRADEMARK
NO LONGER NECESSARY TO OBTAIN ANGLES OF ROTATION FROM GRADUATIONS
FOR BORING, DRILLING AND MACHINING SINGLE OR COMPOUND ANGLES

Roto-Sine uses new method of obtaining both single and compound angles. By use of gage blocks, Roto-Sine provides accurate, quick means of obtaining angles of rotation without use of graduations. Every tool shop will find Roto-Sine the answer to efficient, accurate angle set-ups.
Available in 5 inch and 10 inch models.
Table sizes—
5″ Model H—5½ x 8
10″ Model B— 7 x 12
10″ Model C—10½ x 12
PRICES AND DELIVERY DATES ON REQUEST
PRODUCTS DIVISION
TRIANGLE ENGINEERING CO.
DESIGNERS OF
TOOLS • DIES • GAGES • SPECIAL MACHINES AND PRODUCT DESIGN
410 E NINE MILE ROAD DETROIT, FERNDALE 20, MICH

SEE THIS *Faster* WAY OF PLANING CURVED SURFACES!



7 TIMES FASTER THAN BY HAND

In the planing of irregular-shaped parts, the Turchan Follower method makes possible a production rate greater than anything ever before attained

Take, for example, the gear-like impeller illustrated above, measuring approximately 1 ft. in diameter. Using a template as a guide, the Turchan Follower Attachment completely finishes the three gear-like surfaces to a tolerance of .001″ in 1/7th the time required by hand methods—incidentally, doing successfully what two other devices failed to perform.

"Turn to Turchan"

Equally amazing are the savings in production time when the Turchan Follower is used to finish parts of irregular or eccentric shape on milling machines, lathes, grinders, shapers or boring mills. If you have a production problem on parts of this character, please read our invitation in the left-hand column.

SEND US
Sample or Blueprint of Parts —for Turchan Production Estimate

TURCHAN FOLLOWER MACHINE CO.
8257 Livernois - Detroit 4, Mich.

TURCHAN
Hydraulic Follower Machine

on how to use the Nobur on multi-walled parts is contained in a 4-page leaflet issued by the NOBUR MANUFACTURING CO., Dept. T, 910 N. Orange Dr., Los Angeles 38, Cal. Noburing may be done on steel as well as on the softer metals such as brass, aluminum, bronze and magnesium.
INFORM-A-GRAM KEY No. 164-S

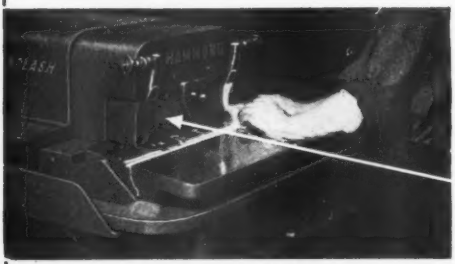
TRANSPARENT SURFACE PLATES are illustrated in a circular issued by the CADILLAC GLASS CO., Dept. TD, 900 W. Cermak Rd., Chicago 8, Ill. These glass surface plates require no de-magnetizing or oiling and are non-rusting. Details or data can be etched on the under side of the plate if desired.
INFORM-A-GRAM KEY No. 549-S

PRECISION TOOL MANUAL which includes descriptions, photographs and price lists of Vard products is available from VARD, INC., Dept. T, 2961 E. Colorado St., Pasadena 8, Cal. Being visual as well as tactual inspection instruments, Vard Roll Thread Snap Gages speed up inspection and increase production. These gages will gage threads right up to a shoulder and check threaded work while still in the machine. Vard taps which are made in a wide variety of sizes from ¼" up in all standard and special pitches, as well as in metric and Acme, are illustrated.
INFORM-A-GRAM KEY No. 509-S

TANTALUM-TUNGSTEN CARBIDE TOOL BLANK Price List No. VR330 recently published by the VASCOLOY-RAMET CORP., Dept. J, North Chicago, Ill., contains a number of new standard tools, and additional sizes in both tools and blanks have been added. Straight turning tools, off-set turning tools, off-set facing tools, lead angle tools, roundnose tools, broadnose tools, solid rounds, boring tools, roller turner tools, cut-off tools, grooving tools, shear type tools, standard blanks, lathe and grinder centers and lathe center tips are illustrated. A carbide standard grade chart is also included.
INFORM-A-GRAM KEY No. 25-S

ABRASIVE BAND GRINDERS which reduce costs and increase production are illustrated in Catalog 43 published by WALLS SALES CORP., Dept. TD, 97 Warren St., New York 7, N. Y. Simplex and Duplex Abrasive Band Grinders for roughing, smoothing and fine finishing are described. The unique features of these Grinders are the instantaneous changeability and fixed running position of the abrasive band and the automatic band tension. The variety of finishes possible and the increased production make these grinders desirable for industries finishing parts made of steel, iron, brass, copper, aluminum, celluloid, bakelite, hard rubber, fibre, wood, horn and ivory.
INFORM-A-GRAM KEY No. 547-S

NEW! Hammond SAFETY FEATURE!



ON ALL CUPWHEEL GRINDERS

LOOK!

EXCLUSIVE Hammond FEATURE!

New safety cup disc, now standard equipment, is the greatest safety unit ever installed on any carbide tool grinder. It is an integral part of cupwheel hood design, adjustable for wheel wear. Prevents operator getting fingers, or dropping tools, into cup of wheel. Before you buy a carbide tool grinder... investigate... compare! Hammond's complete line, from chip breakers to 20" grinders, gives you complete facilities for carbide tool maintenance.

SEND FOR BULLETIN NO. 206

Hammond Machinery Builders INC. KALAMAZOO 54, MICHIGAN

1631 DOUGLAS AVE. KALAMAZOO, MICH.

Eastern Branch: 71 W. 23rd St., New York 10, N.Y.

PRECISION TAPPING WITH YOUR DRILL PRESS

ROTOREX

Converts Your Drill To a

PRECISION TAPPER

Producing Class 3 Threads By Positive Lead Automatic Cycle

The Rotorex Tapper consists of spindle assembly including nut, lead screw and friction brake. Limit switch for automatically and accurately controlling depth of tapping. Foot switch starts the tapping cycle and provides instantaneous emergency reverse. The convenient foot control leaves the operator's hands continually free to prepare and load work.

The Rotorex Precision Tapper is available, on an MRO priority, for immediate shipment for use with 14″ and 17″ Delta Drill Presses — the cost $175. F.O.B. Riverside, California. For further information write today for catalog.

5990R

Douglas Machinery Co., Inc.

150 BROADWAY · NEW YORK 7, N. Y.

PUBLICATION REVIEWS

OPTI-FLATS, the new glass surface plate polished by optical methods and guaranteed accurate well within 50 millionths of an inch is described and illustrated in "PRECISE PRODUCTION", issue No. 105, which is the house organ of the GEORGE SCHERR CO., Dept. J, 200 Lafayette St., New York 12, N. Y. This periodical will be issued regularly during the year to provide readers interested in the advancement of precision controls with news of the latest in accuracy equipment. The latest developments in precision manufacturing methods, inspection practices and shop procedures will be covered.
INFORM-A-GRAM KEY No. B54-S

CONTRACT SERVICES offered to manufacturing plants engaged in the problems of tooling for new or improved products are described in Catalog CS-144 released by the SHEFFIELD CORP., Dept. D, Dayton 1, Ohio. These services include the design and manufacture of tools, dies, jigs and fixtures, special purpose machine tools, and the precision manufacture of threaded and form ground components as well as sub and complete assemblies.
INFORM-A-GRAM KEY No. 24-S

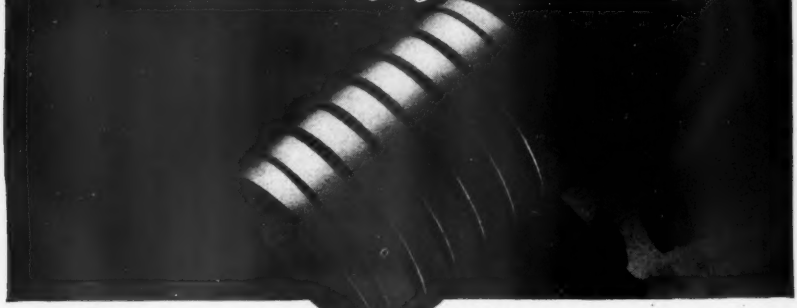
GROUND THREAD CUTTING TOOLS & HOBS are illustrated in Bulletin 644 released by the UNIVERSAL ENGINEERING CORP., Dept. TDJ, Cedar Rapids, Iowa. This company manufactures the U-6 Automatic Thread Milling Machine, and offers descriptions and instructions to customers on the ordering and selection of hobs, taps, cutters and leaders known as the UNECO Line. Information on the operation of the U-6 and data on special gages, jigs and fixtures is included along with photographs and engineering drawings.
INFORM-A-GRAM KEY No. B54-S

"MILLIONTHS OF AN INCH FOR SALE BY VINCO" is the title of a colorfully illustrated 16-page brochure published by the VINCO CORP., Dept. T, 8855 Schaefer Highway, Detroit 27, Mich. Straight-Side Spline Gages which are used to check the individual or composite elements of straight-side splined shafts and fittings are shown along with Thread Ring Gages and Masters. Serration Spline Gages are used to check the individual or composite elements of serrated shafts and fittings and Involute Spline Gages check the individual or composite elements of involute splined shafts and fittings.
INFORM-A-GRAM KEY No. 510-S

"SOLVENT DEGREASING and Effective Methods of Conserving Chlorinated Solvents" is the title of a 16-page booklet recently published by DETREX CORP., Dept. TD, 13005

GIBSON-SPRINGS

Outstanding for Quality



CORRECT design—exactly the right materials—rapid production to close tolerances—thorough testing by most modern devices—every step guided by the "know how" gained through 75 years' quality spring making experience—nothing less can produce GIBSON quality in mechanical springs. Nothing less should be good enough for you. May we quote on your requirements?

THE WILLIAM D. GIBSON CO. 1800 CLYBOURN AVE., CHICAGO 14, ILL.
(DIVISION OF ASSOCIATED SPRING CORPORATION)

HOW TO REGRIND COMPOUND ANGLE TAPS
12 TIMES FASTER!

Now, with this Universal precision indexing head you can grind completely in 5 minutes what normally takes 2 to 3 hours of laborious trial and error work—and duplicate the factory finish on as many taps as you want. Just check this case study—A special tap required 3 angles to be ground, a 45° breaking angle, a 15° gun barrel angle and a 3° hook angle on the gun barrel angle. Using the 3 indexing planes (an exclusive feature), only 2 passes per flute under the wheel were necessary to get number fit and exact duplication.

INDEXES 360° IN THREE PLANES

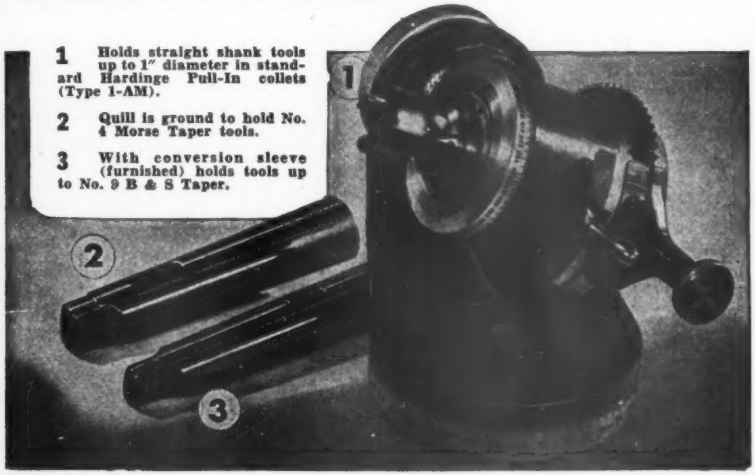
You, too, can use this remarkable attachment profitably. Holds tools firmly, indexes 360° in each of three planes, for any possible simple or compound angle. Bolts onto any tool or surface grinder you may have. Gives you higher precision work because you needn't shift tool in holder. Vernier lever rotates work collet between adjacent indexed points without changing index, giving you control to 1/10 of 1 degree.

You eliminate inaccuracies because all work is accomplished by mechanical setting, and less handling is required. Collet quill is carried on aviation ball bearings instead of ordinary sleeve bearings to reduce friction for spiral grinding. Result is greater accuracy and speed in regrinding tools.

GET COMPLETE STORY!

Investigate this unusual grinding attachment. In addition to holding all the standard tools listed below, it is easily adapted to holding irregular and large shank tools for grinding. Some even use it for light milling work. Among the prominent users who reorder are Boeing Aircraft, Chrysler, General Electric, Sperry Gyroscope, Nash-Kelvinator. Write today for the whole story. It will pay you.

UNIVERSAL THREE PLANE INDEXING HEAD is the only head of its kind . . . can be used on ANY tool or surface grinder . . . holds straight shank, No. 4 Morse Taper and No. 9 B & S Taper tools.


1 Holds straight shank tools up to 1" diameter in standard Hardinge Pull-In collets (Type 1-AM).
2 Quill is ground to hold No. 4 Morse Taper tools.
3 With conversion sleeve (furnished) holds tools up to No. 9 B & S Taper.
1
2
3

CLEVELAND
TOOL ENGINEERING CO.
1261E W. FOURTH ST.
CLEVELAND, OHIO

SEND COUPON TODAY!

CLEVELAND TOOL ENGINEERING CO., 1261E W. Fourth St., Cleveland, Ohio

Please send complete story and Data Sheet E showing how Universal Indexing Head can help me.

NAME .....

ADDRESS .....

CITY .....STATE .....

Hillview Ave., Detroit 27, Mich. It emphasizes fundamental practices for the economical use of degreasing solvents in metal cleaning departments of industrial plants and describes typical designs of degreasers.
INFORM-A-GRAM KEY No. B55-S

SURFACE GRINDER—Model 618 is illustrated in a 4-page folder published by the BOYAR-SCHULTZ CORP., Dept. T, 2112 Walnut St., Chicago 12, Ill. Specially designed and built for tool room and production use, its many outstanding features and advantages include rugged design and construction; smooth, easy acting controls arranged for greater convenience; a newly developed, heavy duty precision spindle using a regular 8" x 5/8" wheel but built to accommodate 8" x 3/4" wheels; improved table design and operation; vertical and cross feed improved with unique method of supporting internal mechanism.
INFORM-A-GRAM KEY No. 612-S

SANITATION SUGGESTIONS—The control or prevention of bacteria growth in coolants used in various machining, cutting, grinding and other operations is of vital concern today to safety engineers and supervisors, shop superintendents and other plant executives. To help combat contamination of these oil-water emulsions which, in some cases, is the source of dermatitis infection on the hands and bodies of machine operators, a new 4-page Special Service Report issued by OAKITE PRODUCTS, INC., Dept. TD, 57 Thames St., New York 6, N. Y., describes many important, successfully used preventive measures. The Report stresses the need for thoroughly cleaning out main supply tanks, individual tanks on machines, lines, pumps, etc., to remove any bacteria-harboring films or accumulations.
INFORM-A-GRAM KEY No. 121-S

ADJUSTABLE CUTTERS are featured in an illustrated Catalog No. 44 available from the ROBERT H. CLARK CO., Dept. J, 9330 Santa Monica Blvd., Beverly Hills, Cal. Diagrams, photos of actual operations, complete specifications and prices, as well as detailed descriptions of the entire line of Clark Adjustable Cutting Tools are contained. Their unique principle of adjustability applied to cutting tools, which has proven so valuable in war production, is fully explained and the adaptability of these tools to reconversion programs is readily seen.
INFORM-A-GRAM KEY No. 92-S

PRECISION-BUILT ACCESSORIES designed to help tool and die makers standardize and simplify their work have just been introduced by the TOOL CRAFT CO., Dept. J, 1835 Westchester Ave., New York 60, N. Y. The line features ready-to-use, press-fit, piercing die

Rubber and Abrasive
WORK TOGETHER
for
FASTER, BETTER
BURRING • FINISHING • POLISHING

Brightboy's combination of rubber and abrasive in exact "balance," simultaneously burrs, finishes, polishes; saves time, improves close-tolerance work.

Ask your distributor to tell you how Brightboy can fit into your present and post-war production. Get Brightboy samples, prices, production data — and assistance from Brightboy field men, always at your service.

BRIGHTBOY INDUSTRIAL DIVISION, Weldon Roberts Rubber Co., Newark 7, N. J.

WELDON ROBERTS
Brightboy

WHY GAMBLE?

CHICAGO
"SAFETY PLUS" SOCKET SCREWS
are accurate to the Nth degree

When purchasing socket screws, why gamble with products of inferior quality? Since 1872, the name Chicago Screw Company has meant precision and quality. Our complete Chicago "Safety Plus" line of Socket Screw Products are not only accurate, but they are tough and strong. Constant supervision by our metallurgical laboratory insures the strength and toughness of these fine products.

This great line includes Socket Head Cap Screws, Socket Set Screws, Socket Pipe Plugs, Socket Stripper Bolts and Square Head Set Screws.

ARMY E NAVY

These Fine Products are sold only thru Authorized Distributors

THE CHICAGO SCREW CO.

ESTABLISHED 1872

1026 SO. HOMAN AVENUE CHICAGO 24, ILL.

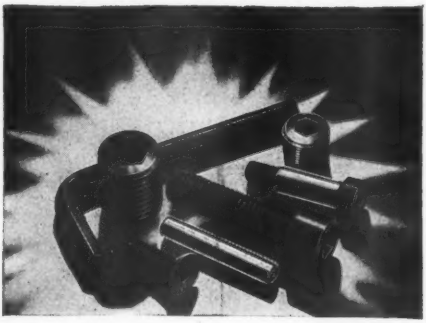
bushings, piercing die punches and press-fit stripper guide bushings, all made of highest grade carbon steel in a wide range of practical sizes. A new catalog section, containing specifications, sizes, other details and prices of Tool Craft accessories is available from the company.
INFORM-A-GRAM KEY No. C23-S

COUNTERBORE SETS are illustrated in a 4-page leaflet published by the GAIRING TOOL CO., Dept. D, P. O. Box 478, Detroit, Mich. Types A, B and C Counterbore Sets are described. Type A is a comparatively low-priced unit especially recommended for production spotfacing and counterboring; Type B is a quick-change tool designed for a wide range of operations and Type C is designed for heavy duty work where maximum rigidity, extra strength and perfect alignment are required.
INFORM-A-GRAM KEY No. 800-S

MUZAK presents specially made and programmed music-at-work to industry, offices and public places. This planned system of work music is based on years of research and experience. An interesting booklet issued by MUZAK CORP., Dept. TD, 229 Fourth Ave., New York, N. Y., covers the kinds of music that are effective in a factory or office to combat fatigue, lift morale and make work pleasanter without penalty to efficiency.
INFORM-A-GRAM KEY No. C21-S

PRUTTON TAPMASTER—A 3-spindle automatic tapping machine which has the capacity to tap three different size holes up to 1" simultaneously is pictorially described in a circular issued by D. H. PRUTTON MACHINERY & TOOL CO., Dept. TJ, 5295 W. 130 St., Cleveland 11, Ohio. This tapmaster employs the lead screw principle and has a safety feature which prevents excessive vertical pressure on the tap. All working parts are readily accessible through removable cover plates.
INFORM-A-GRAM KEY No. B99-S

THE WESTERN ELECTRIC OSCILLATOR, a Western Electric publication well-known to the radio industry before the war as "Pick-Ups" carries in its initial issue a number of articles of significance to the radio industry. The lead story, "Radio Fights Its First War" tells how the men and women of the profession are standing up to their wartime responsibilities. The article is based on a comprehensive survey of individual broadcasting stations throughout the nation. Other titles include "FM Goes to War," "You Can't Win a War Without Radio," "A.T.&T. Plans for Television" and "Seventy-Five Years of Pioneering by Western Electric," a 2-page spread of historic pictures starting with the founding of



WE DELIVER THE GOODS!

Don't Wait Months for

DIE SPRINGS
DOWEL PINS
SOCKET SCREWS

Send us that unfilled order, and we'll ship immediately from stock in most any size and quantity. Largest stock in the state of die springs, dowel pins, socket screws assures you prompt delivery. Give us one chance to prove that "We Deliver the Goods" is not just a slogan, but a fact. Send us one trial order. If we deliver, you gain. If not, you lose nothing.

DOWEL PINS are ground to tolerance of plus or minus .0001". Standard pins ground .0002" over listed diameters; oversize pins ground .001" over listed diameters. In 38 lengths, from 3/8" to 6". In all diameters 1/8" to 1".

DIE SUPPLY COMPANY
4751 HOUGH AVE. • CLEVELAND 3, OHIO • EXpress 1133

New Book

on Tools for Obtaining Accurate Thread Forms in Less Time

Remarkable savings are being made in thread grinding through the use of the new Tru-Thread Diamond Tools for dressing thread grinding wheels.

Tru-Thread Diamond Tools employ a radically new principle, applied for the first time by Wheel Trueing engineers, and utilize the hard characteristics of a diamond of a shape never before used for such a purpose.

The results of this new development are reported by users who tell us—for example—that with Tru-Thread Tools they are running three to four times as many pieces as they obtained with their previous tools.

Tru-Thread Tools obtain wheel forms quickly and accurately and leave the wheel grain sharp and free-cutting. Wheels cut clean, hold their form longer and grind more pieces between dressings. Wheel cost, tool cost, and cost pe piece all are reduced accordingly.

These tools, which are made in types for dress ing each specific form, are completely describe and illustrated in a new booklet which we wil be glad to send you on request. If you hav thread grinding equipment, this booklet wil point the way to substantial savings. Send fo your copy.

WHEEL TRUEING TOOL COMPANY

3200 W. Davison Avenue
Detroit 6 • Michigan

575 Langlois Avenue
Windsor, Ont. • Canada

the Company and extending to its 75th Anniversary this year. In addition to a profusion of interesting photographs done in the modern vein, the publication contains a dramatic spread of four full-page pictures in color. Copies are available from WESTERN ELECTRIC CO., Dept. J, 195 Broadway, New York 7, N. Y.
INFORM-A-GRAM KEY No. 521-S

STANDARD TALIDE-TIPPED CENTERS, featured in Catalog 44-C recently prepared by METAL CARBIDES CORP., Dept. J, 107 E. Indianola Ave., Youngstown 5, Ohio, should be of interest to anyone using lathe and grinder centers. This is the first time that complete standards have been set up on carbide tipped half centers and stub centers. Complete specifications and prices on Full Centers, Half Centers and Stub Centers including standard sizes and styles available are listed.
INFORM-A-GRAM KEY No. 717-S

"QUICK-QUENCH" HEAT TREAT FURNACE, constructed in several sizes and capacities to meet needs of purchasers, is pictorially presented in a folder issued by JAMES H. KNAPP CO., INC., Dept. TD, 4920 Loma Vista Ave., Los Angeles, Cal. This pictorial story shows the cycle of operation which develops maximum yield strength and maximum corrosion resistance. Floor space is saved. All loading and unloading of the parts, at room temperature, is light manual work, therefore saving man hours and permitting the use of unskilled labor.
INFORM-A-GRAM KEY No. B18-S

GUIDE BUSHINGS & COLLETS with Carboloy Inserts are pictorially described in a leaflet published by the WICKMAN CORP., Dept. TD, 15533 Woodrow Wilson Ave., Detroit 3, Mich. Longer life, higher cutting speeds, greater accuracy in the finished product and better finish are advantages of these collets. Because Carboloy does not "pick up" the bar stock material, gouges, scratches and other surface imperfections from this cause are eliminated.
INFORM-A-GRAM KEY No. 526-S

QUALITY CASTINGS molded from Gray Iron and Meehanite are pictorially described in Bulletin No. 1 published by the HAMILTON FOUNDRY & MACHINE CO., Dept. J, 1551 Lincoln Ave., Hamilton, Ohio. Examples of intricate ornamental work and novelties are illustrated as are side frames for multigraphing and billing machines, chart lens frames for cylinder scales, gears for many purposes, electric meter cases, miscellaneous door hardware, miscellaneous castings for scales, cheese cutters, addressing and textile machines and many others.
INFORM-A-GRAM KEY No. 309-S

HOGGSON BRAND
HAND CUT
STEEL STAMPS
Long Service
CLEAN, SHARP IMPRESSIONS
M
CHAMFERED CORNERS -- FOR LOCATING BASE OF LETTER
Deep, hand-cut letters done in special formula steel, the result of 90 years of die making. Faces angled for extreme strength. Ideal for parts identification, tool marking, numbering, etc. Available through mill supply houses.
THE HOGGSON & PETTIS MFG. CO.
NEW HAVEN 7, CONN.

SPECIFY SUPER CARBIDE TIPPED REAMERS

. . . AND GET IMMEDIATE DELIVERY FROM STOCK!

Super reamers are supplied with hardened flutes — eliminating the possibility of them picking up chips and scratching finished surfaces. Shanks are tough rather than hard so they will hold well in chuck or sleeve and present maximum resistance to breakage.

Specify "Super" and you are assured of Super Satisfaction.

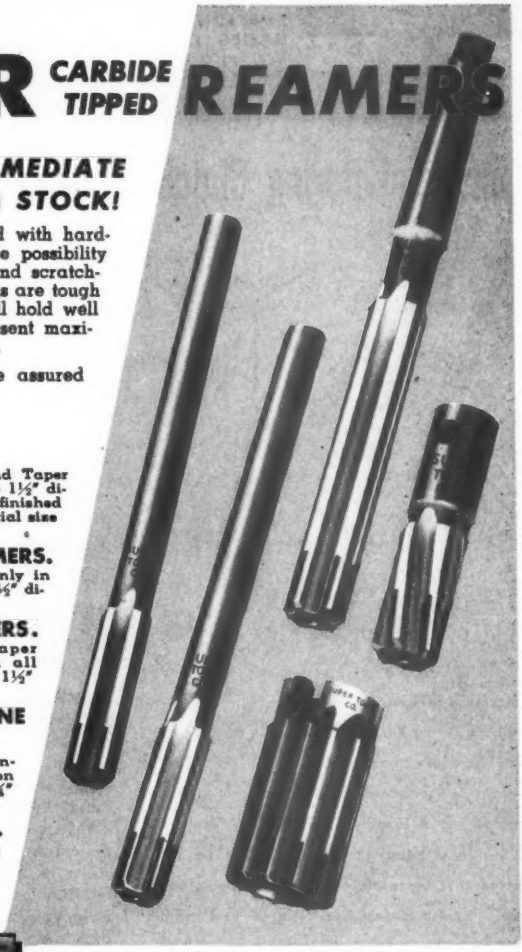
★ **SOLID CHUCKING REAMERS.**
Stocked in both straight and Taper Shank, in sizes from ¼" to 1½" diameter. Also stocked semi-finished for quick completion to special size or tolerance.

★ **JOBBERS TYPE REAMERS.**
Stocked in Taper Shank only in popular sizes from ¼" to 1½" diameter.

★ **EXPANSION REAMERS.**
Made with straight or Taper Shanks, and stocked in all popular sizes from ½" to 1½" diameter

★ **STUB SCREW MACHINE REAMERS.**
Stocked in semi-finished condition for quick completion to specified size from ¼" to ¾" diameter

★ **SHELL REAMERS.**
Standard design. Not stocked Supplied in all required sizes promptly.



WRITE TODAY FOR THIS LITERATURE

Descriptions, illustrations, prices and complete details of Super Carbide Tipped Tools for all types of cutting jobs are given in a series of folders. One or all of these folders will be sent to you upon request. Write today

SUPER TOOL COMPANY
Carbide Tipped Tools
21650 Hoover Rd., Detroit 13, Mich. 4105 San Fernando Rd., Glendale 4, Cal.

PREVIEWS

SURFACE COMBUSTION FURNACES in the Steel Wire Industry are detailed in a 4-page illustrated booklet published by SURFACE COMBUSTION, Dept. TD, Toledo 1, Ohio. The heat treating processes used in this industry consist of several types of annealing, normalizing, spheroidizing, patenting, hardening, and tempering. Annealing is the most common and, for low carbon wire which constitutes the bulk of the tonnage in the industry, it is the only heat treatment used.
INFORM-A-GRAM KEY No. 810-S

Universal Boring Chuck

Especially designed to hold Boring Bars in milling machines or boring mills. Allows bar to be advanced or receded to a length to suit work. Will bore holes to a tolerance of .0005. Can be adjusted to compensate for wear. Made in two sizes to accommodate bars from ⅜" to 1" with milling machine taper or Morse taper shanks. Write for catalog.

REX SPEED PRIME PUMPS—These general purpose self-priming centrifugal pumps, designed to fit a wide range of pumping needs, are described in Bulletin 447, available from the CHAIN BELT CO., Dept. TD, 1600 W. Bruce St., Milwaukee 4, Wis. Illustrated are interesting applications of these pumps in agriculture, industry, oil fields, marine industry and for general utility work. They can be applied to many types of pumping work because of their compactness, efficient operation and positive self-priming feature.
INFORM-A-GRAM KEY No. 815-S

PUTNAM METAL CUTTING TOOLS are attractively featured in Catalog No. 44 recently issued by the PUTNAM TOOL CO., Dept. T, 2985 Charlevoix Ave., Detroit 7, Mich. Its 92 pages pictorially describe the full line of Putnam End Mills, Chucking Reamers, Continuous Pilot Counterbores, Holders and other products. • Full specifications and prices of the 1023 items now in the Putnam line are listed. Additional sections are devoted to Putnam special purpose tools and engineering data invaluable to cutting tool users. Copies will be sent to those requesting it on company letterhead.
INFORM-A-GRAM KEY No. A80-S

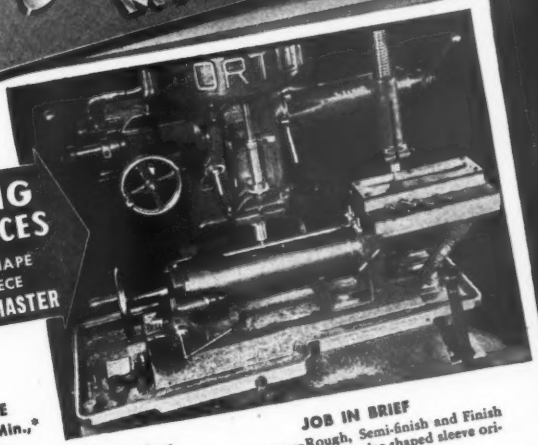
SMITH MASTER SURFACE PLATES, made to meet the most exacting requirements of the tool, gauge and aircraft industries are presented in a 4-page leaflet published by SMITH TOOL & ENGINEERING CO., Dept. T, 858 N. Sandusky Ave., Bucyrus, Ohio. The large elliptical rib, reinforced with internal spider rib construction and supporting ribs to outer edges is an exclusive feature of these plates. Precision Lapping Plates, specifically designed for developing a true plane of close tolerance thus insuring a perfect fit when lapping metal-to-metal joints, and meeting all other applications requiring accurately flat lapped surfaces, are also featured.
INFORM-A-GRAM KEY No. 465-S

"POLAROGRAPHIC ANALYSIS" is the title of an illustrated brochure available from E. H. SARGENT & CO., Dept. TD, 155-165 E. Superior St., Chicago 11, Ill. This analytical method, based on current-voltage curves and relying principally upon the dropping mercury electrode to provide a completely polarized electrode in conjunction with one which is not polarizable, is thoroughly discussed.
INFORM-A-GRAM KEY No. 92-S

GORTON

SPECIALISTS FOR OVER 50 YEARS IN

Tracer-Controlled MILLING



PROFILING *TWO* ORIFICES

OF IRREGULAR SHAPE
IN TUBULAR PIECE
From ONE FLAT MASTER

SIX Operations Completed on ONE Machine in 40 Min.,* Floor to Floor

Gorton Tracer-Control Duplicating provides a simple, fast and accurate means for machining irregular shapes in parts like this Bronze Recoil sleeve shown above. Specifications for this job called for an orifice on opposite sides of the sleeve.

Both orifices required a rough, semi-finish and finish cut—the latter with a ¼" diameter end mill to produce a ⅛" radii at the two corners. Only one set-up is necessary to complete the six operations (3 cuts around each of two orifices) accomplished with a high degree of uniform accuracy, in 40 minutes, floor-to-floor time.

The simplicity of Tracer-Controlled operation permits even the most difficult work to be accomplished by inexperienced help.

*NOTE—Time greatly reduced in other plants by using a battery of six or more Gorton Duplicators in multiples of three (1 for each cut) eliminating ALL cutter changes.

JOB IN BRIEF

6 Operations—Rough, Semi-finish and Finish Milling of *TWO* irregular shaped sleeve orifices.

Material—Bronze.

Cutters—(only 3 needed)—Four-flute, fast spiral end mill, 7/16" diameter, two End Mills, ⅜" and ⅛" diameter.

Speed—1900 r.p.m.

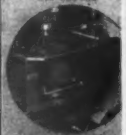
Feed—Manual.

Production—40 minutes per sleeve.

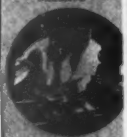
GORTON FREE ENGINEERING SERVICE

You are invited to consult Gorton engineers on any jobs applicable to Gorton equipment. Please submit details of your job to your nearest Gorton Dealer or Factory at Racine, Wisconsin. Recommendations made without charge or obligation.

The *Right* Size The *Right* Type of Machine for Every Job . . .
From 2 oz. to 2 ton DIE BLOCKS



Tracer-Controlled MILLING



Tracer-Controlled DUPLICATING

Tracer-Controlled ENGRAVING

Tracer-Controlled ETCHING

GORTON *Precision* MACHINES

OUTER RACERS | ETCHING MACHINES | 2 & 3 Dimensional PANTOGRAPHS | Vertical & Universal Head Super-Speed MILLERS | Manual & Electric Control DUPLICATORS

TEAR OFF COUPON AND MAIL TODAY

George Gorton Machine Co.,
1212 Racine St., Racine, Wis.
Send me these free books

☐ Condensed Catalog
☐ Die and Mold Duplicators

Name..... Title.....

Company.....

Address.....

City..... State.....

IMMEDIATE DELIVERY
FROM STOCK
On Standard Sizes

HIGH SPEED—PRECISION
CENTER
DRILLS

Attention!

ALL SCREW MACHINE HOUSES

Here is just what you have been looking for. A High Speed, accurate Center Drill that guarantees a perfect center every time.

No longer is it necessary for you to cut down one of your drills for centering purposes. These tools are designed to give long and dependable performance.

SINGLE END—RIGHT AND
LEFT HAND AVAILABLE

★

Satisfaction assured on a complete stock of all types of standard cutting tools and end mills.

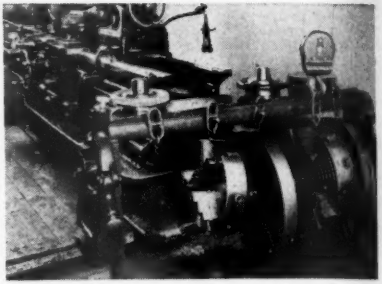
Prompt Delivery on Special Tools, Dies, Jigs and Fixtures Made to Your Exacting Requirements

★

Write for prices on standard sizes or submit blueprints for special sizes

Galter Manufacturing Co.
711 W. Lake Street - Chicago, Ill.

Lathe Chuck Stand Facilitates Parts Storage



A lathe chuck stand, devised by the Supercharger Division at General Electric's Lynn River Works, facilitates the storing of parts after use. It is a compact device that saves time and considerable space in the factory.

The stand, usually set at the end of a lathe where it will be handy for use in storing lathe chucks, face plates, steady rests, and dog plates, is composed of two channel steel uprights, approximately 3 x 1½ x 27 inches. Each is fastened vertically to a ¾-inch base plate, 24 inches long and four inches wide. The two uprights, each with two four-inch pegs, are connected by a three-inch pipe containing five pegs.

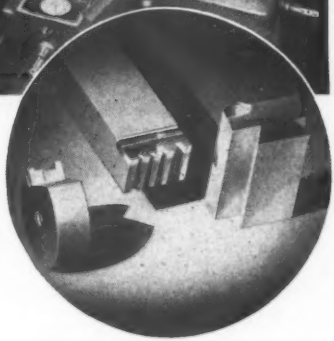
Attached to the back and top of this pipe is an eight-inch shelf, cut from ¼-inch stock and supported by triangular-shaped gussets. For the convenience of holding various chuck tools, sixteen holes with a one-inch diameter are drilled into the shelf.

The main feature, used in connection with the stand, is the combination double link and eyebolt. The eyebolt may be screwed into the chuck or other tools to be stored. The double link, about five inches long and two inches wide, is used for raising and holding the parts. The upper part of the link is used for the crane hook, and the bottom part can be guided by the crane operator so that it hooks onto one of the pegs on the stand.

The stand helps to eliminate the liability of breaking the chucks and provides an efficient storing arrangement.

THESE Wickman PRINCIPLES

LAYOUT 50 TIMES THE SIZE OF PROFILE TO BE GROUND
50 TO 1 PANTOGRAPH
30 POWER MICROSCOPE
CROSS HAIRS OF MICROSCOPE FOCUS ON WORK AND GRINDING WHEEL. INTERSECTION OF CROSS HAIRS CORRESPOND TO THE POSITION OF THE POINTER ON 50 TIMES SIZE LAYOUT.



Make Possible The ACCURATE GRINDING Of Profiles Such As These In Tungsten-Carbide Or Other Hard Metals

• The Wickman Profile Grinder has for a number of years proved exceptionally efficient for the grinding of irregular shaped contours on flat or circular form tools, male and female profile gages, punches, open and sectional die segments, etc.

• Accuracy is held to within ± .0005". This accuracy is not affected by wheel wear and no special shapes or radius dresser need be used.

• Finished parts can be checked against the layout without removal from the machine. Reversing the operations followed in grinding, layouts can be made of parts having previously undetermined profiles.

Literature Containing Full Information Is Yours for the Asking

THE Wickman CORPORATION
15533 WOODROW WILSON
DETROIT 3, MICHIGAN

OLIVER

DIE MAKING MACHINES

SHOULD BE A PART OF YOUR POST WAR PLANNING

They will greatly simplify your Tool and Die program. They will speed up those many die jobs. They save 50 to 60% of the labor as compared to hand methods and permit the use of less skilled mechanics.

• • • •

Avoid cheap substitutes — buy the Original Oliver — a tried and proven tool—over 25 years of satisfactory service to thousands of users. Excellent delivery.

• • • •

Send for complete literature today—put this machine to work — you will find it to be the busiest tool in your shop. Model S-1 illustrated.

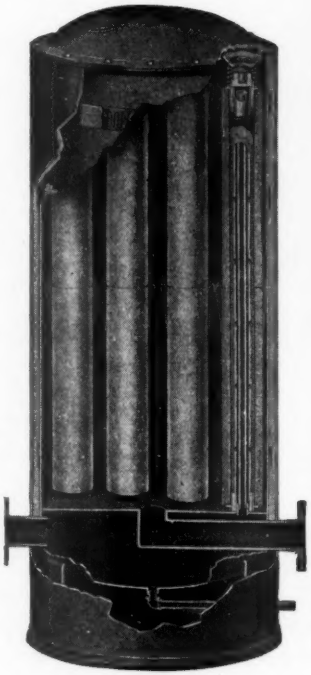
We also build Drill Grinders, Tool and Cutter Grinders, Face Mill Grinders, Template Tool Bit Grinders, Point Thinners

OLIVER INSTRUMENT COMPANY

1436 E. Maumee St. Adrian, Michigan

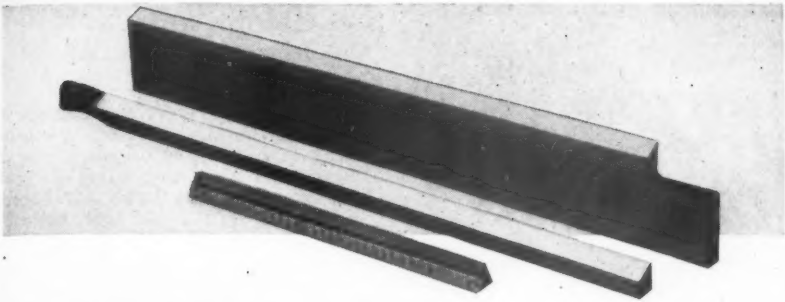
Honan-Crane Purifier

Honan-Crane "M" Type Purifiers are designed to use single or multiple cartridges in standard groupings of 1, 3, 4, 6, 8, 10, 14, 18, 20, 24 and 38 according to the capacity needed. The engineering design of this Purifier makes it highly effective in marine and many other types of installations.



Features include: high flow rate; cartridge type refill elements are used in standard size $7\frac{7}{16}$ x 18; direct connected or bulk station use; uses either Fullers Earth or Navy type cotton waste cartridges; used cartridges easy to remove and replace; cartridge when loaded with contamination weighs approximately 30 lbs, and is easy to lift from Purifier; double decking of two cartridges saves floor space; operation of Purifier except changing cartridges is entirely automatic and does not require additional labor to operate.

INFORM-A-GRAM KEY No. 322-S

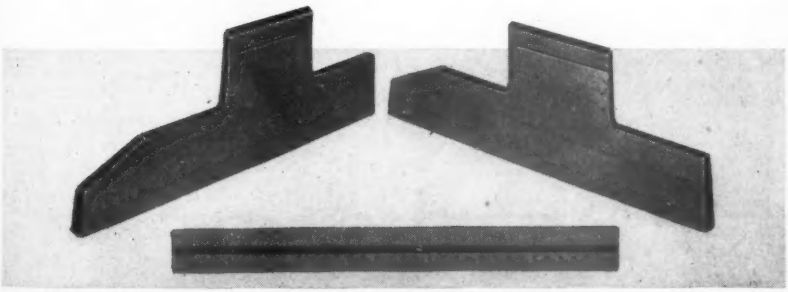


CENTERLESS GRINDER BLADES TIPPED *with* COLMONOY No. 6

● We can furnish tips separately, or provide complete tipping service, consisting of casting tips of Colmonoy No. 6 and applying them to a mild steel base with Silver Solder or low temperature brazing alloy. Special holding fixtures prevent warpage of blade. Write for Bulletin CG-7 for prices and complete information.

WALL-COLMONOY CORP.

720 Fisher Bldg., Detroit 2, Mich.



NEW Angle Adaptor

Converts any drill press into a versatile multi-purpose machine.

Permits any spindle angle . . . at any height . . . horizontally or vertically.

Simplifies clumsy operations . . . speeds production . . . eliminates operator fatigue.

Makes burring, sanding, buffing, grinding, angle drilling, polishing, rotary filing, wire brushing, tapping, reaming, honing, etc., more convenient, twice as fast!

Adaptable to all drill presses with tubular columns . . . rigid construction . . . POSITIVE LOCKING. Write now for descriptive literature, details.

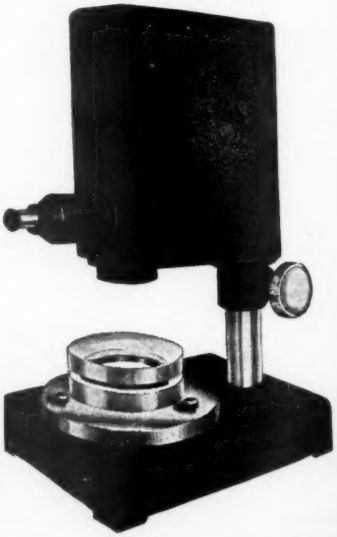
NOBUR MANUFACTURING CO.
908 North Orange Drive
Los Angeles 38, California

Light-Wave Tool Measures Parallelism

A new instrument, the Acme Light-Wave Parascope, especially designed for measuring the parallelism of seal rings and similar objects, and to determine the change of parallelism under any desired pressure, has recently been announced by the Scientific Division of Acme Industrial Company.

In addition to its use for measuring parallelism, the new instrument may also be used for measuring the comparative heights of objects, such as balls for precision bearing, all of which must be the same size within a few millionths. In general, to measure parallelism, the work is laid on an optical flat with another optical flat placed on top. The entire assembly is then set on the stage of the Parascope. Looking into the eyepiece the operator will see a number of bright and dark bands. Each dark or light band indicates a change in separation of the optical flat surfaces of approximately 10 millionths of an inch (actually 10.8 millionths). The operator need only count the number of dark or light bands and multiply by 10 to determine the out-of-parallelism in millionths. This new instrument can also be used

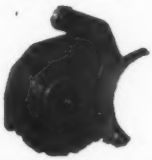
(TO PAGE 176—PLEASE)



A PARALLEL SURFACE GRINDER FOR THIN PIECE ACCURACY

With All Its Variables Under Precision Control

Here Are Some New Extraordinary Grinder Improvements . . .



Accurate Control of Feed Wheel and Guide: With the hand control, shown lower right, the segmented feed wheel may be accurately adjusted to bring the work between the grinding wheels. The guide, above, centers the pieces.

Wheel Dressing: The dressing tool, after hand location, is power driven and rigidly controlled.

Pre-Loading Magazine: Pieces for grinding are set in this tubular track on end, and are drawn to the feed wheel by a counter weight.

Besly No. 218 Outperforms on Any Job In Its Field

The accurate parallel-grinding of thin pieces such as compressor piston rings, thrust washers, fuse plates, ball bearing races, etc. can now be handled at high production speed and within fine limits with the Besly No. 218 double-spindle grinder.

By employing a segmented feed wheel warping due to heat has been eliminated. A hand wheel controls the positioning of both the feed wheel and its guides permitting quick accurate adjustment.

Other new advantages in the No. 218 model are—magazine feeding of parts to the feed wheel, a power driven, highly accurate, time-saving wheel-dressing attachment, and centrifugal distribution of coolant to the grinding wheels through the hollow spindles. The No. 218 has the basic advantages of Besly engineering experience such as freedom from undue wear, elimination of wheel vibration, etc., to deliver accurately ground pieces at new low cost.

Write for details. Ask for the new Besly Titan Abrasives Catalogue.

CHARLES H. BESLY AND COMPANY
118 N. Clinton St., Chicago 6, Illinois Factory: Beloit, Wis.

BESLY

BESLY GRINDERS AND ACCESSORIES · BESLY TAPS · BESLY TITAN ABRASIVE WHEELS

(CONTINUED FROM PAGE 174)

for making the usual light-wave check for flatness.

Acme Scientific Div. of Acme Industrial Co., 206 N. Laflin St. Chicago 7, Ill.

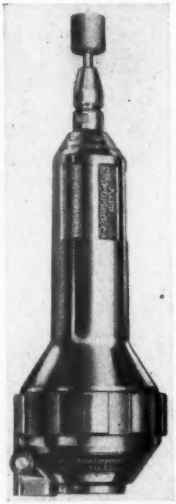
INFORM-A-GRAM KEY No. 59.5-S

Universal MIKRO-LOK Boring Bars

The perfect tool for finishing cuts with extreme accuracy. Especially adapted to boring to a shoulder, or to the bottom of a hole or for taking intermittent cuts. Extremely Rigid. Easily and quickly adjusted like a micrometer. You can depend on graduations for controlling hole size to within .0005. All standard type shanks available. Singly or in sets. Prompt delivery. Write for catalog.

New Madison-Kipp Hand Grinder

A new featherweight hand grinder was announced this month by Madison-Kipp Corporation, 212 Waubesa St., Madison 4, Wis. It was made ready for post-war production but it can be manufactured now because of the availability of aluminum and magnesium. The grinder is described as completely new, inside and outside.



The Model JA grinder has only 23 parts including such minor items as name plate and drive screw. Overall length is 6½" and the extremely light weight—only 12 ounces—is accomplished by the use of aluminum and magnesium parts. The grinder accommodates Kipp mounted grinding wheels, cutters and other accessories having ⅛" diameter shanks.

Shaft diameter has been increased over former models. It is made of ⅛" round alloy steel, ground to .547 (former size .315). The shaft is mounted on two selected special high speed New Departure ball bearings with Formica Retainers. Large size on the shaft increases grinder stability, promotes smoother running and thus increases grinder efficiency and lengthens grinder wheel life.

Speed of the grinder is closely controlled by a new sleeve type governor. The speed of the standard model is 50,000 RPM. Higher speeds can be obtained at additional cost, but the manufacturer requests that supporting engineering data be submitted and that the operation be carefully supervised.

The new grinder operates on air pressures from 30 to 120 pounds but ideal results are obtained from the usual shop air pressures of 80 to 90 pounds.

INFORM-A-GRAM KEY No. B86-S

FAST, UNIFORM PART MARKING...

If the metal parts you manufacture require accurate marking or numbering for easy identification, this improved Mercury Type Holder is an outstanding help in *simplifying* your marking job!

This tool holds the *entire part number*—up to 20 characters if needed. Each character is rigidly aligned and held in place so that, with a single blow of a hammer, the entire number is clearly and neatly stamped on the part. It's fast, fool-proof—and entirely eliminates the time normally consumed when using dies for each separate letter or figure. Moreover, such common errors as wrong sequence, strike-overs, overlapping numbers, etc., are no longer a problem with the Mercury method!

And here's an outstanding feature: the Mercury Holder accommodates five type sizes, and all type is quickly interchangeable to meet a whole range of numbering needs. So, with even a single Holder and a selection of type sizes, you can be ready for any numbering job that comes along! The Mercury Holder is *compact*, important when working with small parts . . . it is of all-steel *machined* construction for long life . . . it has just *four* simple parts . . . and it has many other important features you should know about. Hardened and ground hand cut steel type is available in a full range of sizes.

Full details, including ordering data and specifications for both hand and press style holders, are available for the asking. Write Department D today!

IMMEDIATE DELIVERY!

MERCURY METAL DIE AND LETTER CO.
546 EAST 16TH STREET, LOS ANGELES 15, CALIFORNIA

"10 MILLION PIECES

without a single rejection, thanks to MICRO-CHEK"

-says LUCAS SCREW PRODUCTS, Inc.

Users of nearly 100 Trico MICRO-CHEKS, Lucas Screw Products, Inc., of Rochester, N. Y., reports:

"We find them to be a low-cost economical way of controlling accuracy on high precision automatic screw machine production. In numerous cases, we have reduced our gage cost from 50 to 75 per cent. They check close tolerances . . . eliminating fatigue and uncertainty upon the operator. Their simplicity enables us to use inexperienced help in final inspection. In one case we produced 10,000,000 pieces without a single rejection from the prime contractor."

Speed inspections in YOUR plant with TRICO MICRO-CHEK Comparator Gages, now in use in more than 3600 war plants . . . on machines, on inspection lines. Send for booklet which illustrates many applications.

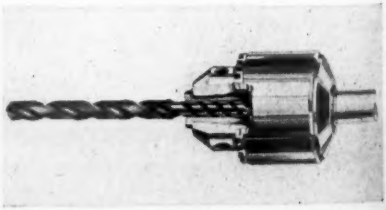
TRICO MICRO-CHEK
TRICO PRODUCTS CORP.
40 Trico Square, Buffalo 3, N. Y.

"Shankless" HSS Roll-Forged Drills

This new departure in twist drills was originated and perfected by a man who previously had no experience in making twist drills. The inventor is Raymond R. Rausch who is presently the General Superintendent of the Ford Motor Company.

The makers of this new tool, the Republic Drill & Tool Co. of Chicago, describe it as "a new style High Speed Drill," with a continuous flute, produced by roll-forging and hot-twisting, and driven by a removable taper shank, known as a Drill Driver. The drill driver, however, is not a new tool—in fact, it has been widely used for over 25 years, for driving the smaller sizes of conventional straight shank drills.

Before being presented to industry,



SAVE PRODUCTION TIME

with a SHOPLIFTER

One man can handle heavy dies alone. Not necessary to stop other machines to get help.

MORE production per day from your machines if a Shoplifter is handy to do the heavy job of moving dies from storage racks to the press. In these times when maximum production of machines is of vital importance, much time and labor can be saved if the operator can handle the heavy work of changing dies without calling for help from other operators.

The Shoplifter is built for this job. Dependable and safe with a rated capacity of 500 lbs. (heavier machines up to 5000 lbs. can be furnished). Entire machine built of structural steel. Electrically welded throughout. Steel platform 24" x 24", lifts 54" above floor and lowers to within 4⅞" of floor. Overall height 72". Crank, up and down, hoist unit.

ECONOMY ENGINEERING CO.
2659 W. Van Buren St., Chicago, Ill.

Price $147.50

IMMEDIATE DELIVERY

$29.75 in U.S.A.

Weight 12 Ounces; Length 6¾ In; Chuck Size ⅛ in. Wheel Guard Removed for Better Illustration

The Model JA is new in design both inside and outside. In it are utilized fewer parts, and they are made of Magnesium and Aluminum for extreme featherweight lightness. The alloy steel shaft diameter is unusually large for sustained smooth and true operation. This means still longer wheel life and better grinding. The speed, as before, is governed at 50,000 R.P.M. and there are selected ball bearings, front and rear. The JA Featherweight is a distinct improvement over all models previously produced by Madison-Kipp, the originators of really high speed grinders.

The same low price, $29.75 in U.S.A., remains. It is a post-war design for which materials have been released early. The pre-announcement output was geared to expected demand. Deliveries will be made out of stock as long as possible.

MADISON-KIPP CORPORATION
212 WAUBESA ST., MADISON 4, WIS., U. S. A.

the new "shankless" drill was thoroughly tested by three large users of twist drills. It is reported that the Tool Supervisors of these three plants have not only certified the drill to be superior to conventional drills but have expressed the opinion that this new drill is going to revolutionize the twist drill industry.

That the first drill manufacturer to put these new drills on the market happens to be Republic Drill & Tool Co., is explained by the fact that Republic's Chief Engineer, Harry W. Delaney, is a Ford man. Prior to joining Republic in 1940, Delaney had spent 25 years with Ford Motor Company and was in charge of Ford's River Rouge Drill Department at the time Raymond Rausch's "shankless" type drill was perfected.

Republic Drill has pointed out that the basic patents on roll-forged and twisted drills, as well as drill drivers, expired many years ago and that other drill manufacturers will be able to make "shankless" type drills and drill drivers without risk of patent infringement.

Scully-Jones & Co. of Chicago and J. C. Glenzer Co. of Detroit have announced that they will manufacture and sell, through their established distributors, a complete line of drill drivers for Republic's new shankless drills.

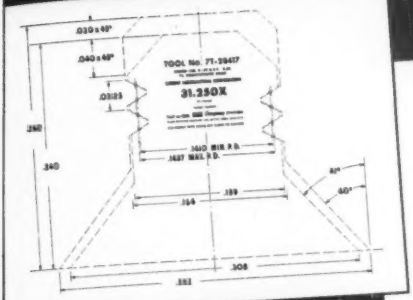
Along with the new "shankless" drill, Republic has presented for the first time its new "All-Flute" High Speed Straight Shank Drill. This drill is described as "the little brother of the shankless drill" because it is produced by the same roll-forging and hot-twisting processes as are used in making the shankless drill. The all-flute drill is offered in sizes ¼ to ½-inch diameter and can be used in all standard drill chucks, without the use of special holders of any kind. The straight shank end of the all-flute drill is produced by giving that end of the fluted section an extra twist which causes the spiral flutes to be compressed so that the shank can be gripped firmly in any standard drill chuck.

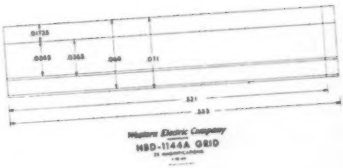
INFORM-A-GRAM KEY No. 440-S

Sanford Heads Die Casters

A. J. Sanford, head of the Cleveland Hardware & Forging Co., was elected president of the American Die Casting Institute at a meeting of that organization held last month in Chicago.

Reduced INSPECTION COSTS AND *Increased* ACCURACY!





INSPECT WITH OPTICAL COMPARATORS AND USE *precision* PLASTIC *comparator charts*

MADE BY GAGE COMPANY FOR EVERY TYPE OF OPTICAL COMPARATOR

Greater use of optical comparators on the inspection of nearly every type of work has speeded up handling time on operations in many plants. • Especially is this true when GAGE Company's Precision Plastic Comparator Charts are employed. They afford master gage performance because of their exceptional accuracy, and work is inspected at a glance and without a doubt because of their extremely fine, clear legibility. • Many hundreds of these charts, specially constructed for specific inspection purposes on the line (and in the toolroom, too) are rendering invaluable service all over the country on work of every imaginable kind—from the assembly of radio tube grids to sorting rivets. • They are not as expensive as you might think, despite the extreme accuracy of their construction, which is far superior to the conventional hand-drawn or scribed layout. As a matter of actual fact, they frequently pay for themselves many times over on the first run. So many concerns are using our specially constructed Precision Plastic Comparator Charts that we have established a department for the sole purpose of making special layouts of this nature. With it we are making available the services of engineers who have had more than 30 years' experience on not only the use of comparators but in the application of gages and gaging methods of all types, covering every form of work.

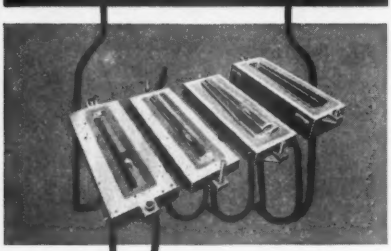
FREE CHART ANALYSIS SERVICE

We are glad to give you the benefit of this experience by free analysis of your inspection problems . . . without cost to you. Simply write us, enclosing prints of the work involved and stating your problems (also giving full particulars of the optical comparators you may have). We shall be glad to advise you as to the practicality of inspection by comparator. • If charts are desired, give us complete particulars and we shall submit preliminary layouts for such items without charge.

GAGE *Company* DIVISION — BATTLE CREEK MICHIGAN

MAKERS OF PRECISION PLASTIC COMPARATOR CHARTS • PRECISION GROUND MASTER GAGES FOR SET-UPS • PROFILE GAGES, CAMS AND TEMPLATES FOR CONTOUR MACHINING OPERATIONS OF ALL TYPES

STRENES METAL POINTS THE WAY



Here are a couple Strenes case histories that may suggest a way to reconvert to civilian production a little faster.

Tractor Top-Dies

Strenes Metal—cast-to-shape—was specified for stamping tractor hood tops. An accurate cost check showed a saving of around 50% in machining time due to the cast-to-shape construction. On reconversion tooling rush, such a saving will be highly advantageous.

Hydrator Pan Die

Dies of Strenes Metal stand up, too. One refrigerator hydrator pan die, for instance, stamped 2,000,000 parts with a 3½" draw out of .50 material. And, due to the self-lubricating property of the metal, stoning and polishing operations were virtually unnecessary.

Both for civilian and war products, Strenes Metal has been a definite help on many tooling programs. Facts and figures on request. Write today.

Strenes Metal for drawing and forming dies.

THE ADVANCE FOUNDRY CO.

Dayton 3, Ohio

Strenes METAL

Lyon Blueprint Cabinets

Specially designed for safe flat storage of valuable drawings, tracings, blueprints, charts, photographs and other large papers—Lyon steel blueprint cabinets for industrial requirements are again available, it is announced by the manufacturer.

After America's entry into the war, all manufacturing of steel blueprint cabinets was stopped. Because of these restrictions, many plants using large quantities of prints and other valuable papers, were forced to seek other less secure methods of safe, flat storage. Substitute materials could not be used effectively because they were not fire resistant.

The Lyon Blueprint Cabinet has a rigid frame for continuous perfect alignment of drawers. All drawers and compartments within drawers are equipped with hinged paperweights in front and protecting hoods in the rear, which insure that the contents will remain flat at all times.

Drawers, equipped with attractive handles and labelholders, can be divided in many different ways. Partitions are standardized and interchangeable. Sections may be placed one on top of the other and either an open sanitary or closed base can be used.

For complete details about the cabinets, write for catalog No. 331 directly to Lyon Metal Products, Incorporated, General Offices, Aurora, Illinois.

INFORM-A-GRAM KEY No. B7-S

Copper Head Laps are Economical to Use. The only Wearing Part is the Replaceable Copper Sleeve.

COPPER HEAD LAPS PAY FOR THEMSELVES IN TIME SAVED

Costly tool room time is saved when you use Boyar-Schultz Copper Head Laps. They are also fast working . . . a double saving. Copper Head Laps never wear out; sleeve adjustment feature permits maintaining correct lapping size till worn out when it is replaced with a new sleeve. Available from Stock in standard sizes, 1/8" to 2½".

BOYAR-SCHULTZ SMB MACHINE BOLTS
SAVE the Machine - SAVE the Job - SAVE Time

Heat treated alloy steels make them T O U G H for heavy work; machined heads and carefully cut threads make them A C C U R A T E for the most exacting tool room work. Heads are machined square with bodies, presenting a clean, flat surface to the T-Slot. Work is held tightly under heavy machine cuts. Close adjustments are possible.

Avoid worn or poorly made bolts. They can cause costly damage to machine beds, ruining the machine's accuracy.

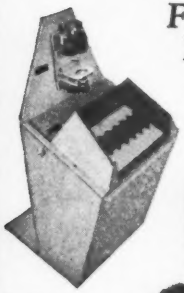
For best results, use SMB Nuts and Washers. They are specially made for use with SMB Bolts.

BOYAR-SCHULTZ CORPORATION

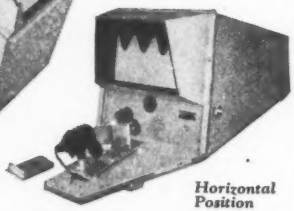
2112 Walnut Street **CHICAGO 12, ILLINOIS**

FS Optical Contour Comparator

Fast, Accurate Inspection of small parts

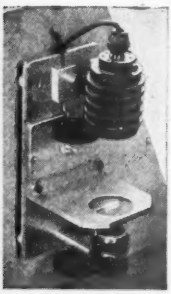


Vertical Position



Horizontal Position

Can be used in either horizontal or vertical position



Stage on which object is placed

With the FS Optical Contour Comparator you can make fast—but detailed—visual inspection of small intricate shapes such as screw threads, dies, gears, or parts of instruments, gauges, etc., checking their height, width, thickness, radius, etc., in a few seconds.

Accurate projection of the contour of the part being checked is instantaneous. An unlimited number of similar objects can be checked in rapid succession after one preliminary adjustment.

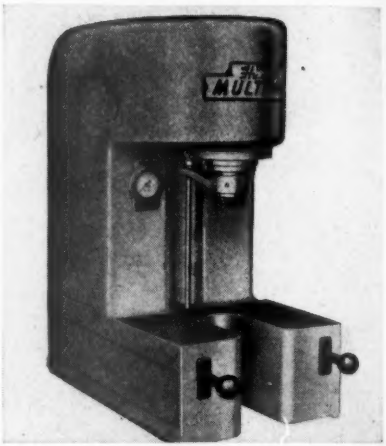
The Comparator's powerful aspheric condenser system and special lens produce an instantaneous accurate screen projection with a definite magnification of 24x. Other magnifications on special order. The unit is convenient, compact.

Write today for Bulletin OC-292.

FISH-SCHURMAN CORPORATION
230 East 45th Street, New York 17, N. Y.

Fish-Schurman

Denison Multipress



A new and economical means of speeding up operations requiring anywhere from 300 to 8,000 pound pressures in single or repeated up and down strokes is offered in a new bench machine just introduced by The Denison Engineering Company of Columbus, Ohio.

Called Multipress because it is basically an oil hydraulic press of many uses, it will deliver up to 4 tons downstroke pressure and up to 5000 pounds "pull up" pressure. It is completely self-contained in a streamlined housing measuring only 16" x 26" x 34" and weighs only 745 lbs and it has been designed to utilize a wide variety of accessories and fixtures with which it can perform numerous production operations, such as pelleting, honing, broaching, peening, assembling, burnishing and straightening.

Operation is simple. Depressing the control levers causes the ram to descend. Releasing either lever stops the ram instantly. Releasing the other lever causes the ram to return to its upper limit, where it is positively held. Depressing the levers slowly causes the ram to be "inched" downward slowly and positioned exactly above the work before pressure is applied. Full pressure can be applied at once, by depressing both levers at once, or pressure may be applied gradually by slowly depressing the

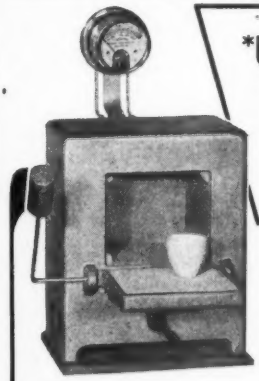
CRITERION *Boring Heads*

Original Accuracy *Maintained*

Noted for maintaining original accuracy over a longer period. Criterion Heads are smooth, compact, rigid. Parts subject to wear are hardened. Lead screw is hardened tool steel, with threads ground from solid after hardening. All heads have large, graduated dial. Large offset adjustment eliminates need for offset boring bars. Two sizes: 1½" and 3". ½" and 1" bar capacity. Shanks are interchangeable, enabling operator to use head on different machines. Ideally adapted for slide boring tool holder on small turret lathes. Ask your dealer or order direct. Request free literature.

Lead Screw ground from solid AFTER hardening.

CRITERION MACHINE WORKS
BEVERLY HILLS, CALIFORNIA



*Uniform Temperature Handy . . . Portable Fast Heating

• The heating element in the Temco furnace operates with unusual speed. A working temperature of 1500° F. is attained in only 30 minutes and intermittent peak loads of 1850° F. are within the practical range of this rugged, long life furnace. A four point switch provides temperature control in four ranges and adjustable rheostat bands allow close heat selection within any range. The accurate, dependable pyrometer is calibrated to 2000° F. and 1100° C. in 50° increments.

***MUFFLE CHAMBER** has the exclusive feature of an embedded heating element which covers all four sides of the heating chamber. This eliminates "cold spots", assures a uniform temperature in every part of the chamber, and protects the elements against damage and oxidation.

Temco furnaces are built for either 115 V. or 230 V. current consumption 1200 watt maximum. Heating chamber 4" wide, 3¼" high and deep. Outside dimensions 8¾"x 13½"x10". Shipping weight 30 lbs. **COMPLETE WITH PYROMETER (115 V.)..... $42.50**
For 230 V.—$5.00 additional

See your supply house or write

THERMO ELECTRIC MFG. CO., 474 W. Locust St., Dubuque, Iowa

TEMCO ELECTRIC FURNACE

Miccro
Supreme

LAY-OUT AND IDENTIFICATION DYE

IN 12 COLORS

Red
Blue
Green
Brown
Black
Purple
Cerise
Yellow
Violet
Tangerine
Chartreuse
Aquamarine

Used for Both

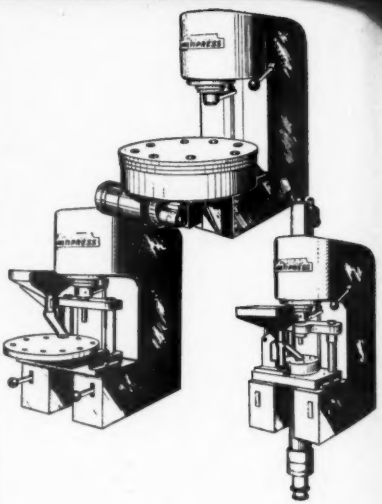
★TOOL, DIE, PATTERN OR TEMPLATE LAYOUT ON METAL.

★QUICK IDENTIFICATION OF BAR STOCK, SHEET OR STRIPS, TOOLS, DIES OR PARTS.

DRIES INSTANTLY
QUICKLY, EASILY REMOVED

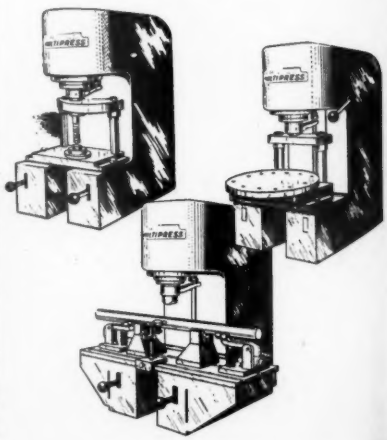
Circular giving full information and prices sent upon request.

MICHIGAN CHROME & CHEMICAL COMPANY
6350 E. Jefferson Ave. • Detroit 7, Mich.



levers. The eye-level gauge indicates pressures. Dual controls require the use of the operator's hands, thus providing a safety feature.

Among available accessories and fixtures is "Automatic Cycling", by which a single lever affords the operator his choice of four automatic actions. Another accessory is a compact, motor-driven indexing table, for rapid and continuous operations. Six stations, indexing under the synchronized ram, can be loaded and unloaded at optional speeds. *INFORM-A-GRAM KEY No. 260-S*



C-F POSITIONERS

When "Position" Counts Most

On automatic welding jobs, like the one illustrated here, position counts "most", and with the C-F Positioner (with 6 sizes, and capacities to 30,000 lbs.) the tables tilt to 135° beyond horizontal and rotate 360°, all under push button control. The exclusive C-F Variable-Speed Control gives table rotations ranging from 0 R.P.M. up for all sizes. For "quick change" of position, for greater time saving and efficiency, for lower costs and greater safety to men and materials, specify C-F Positioners for all *automatic* and production welding operations.

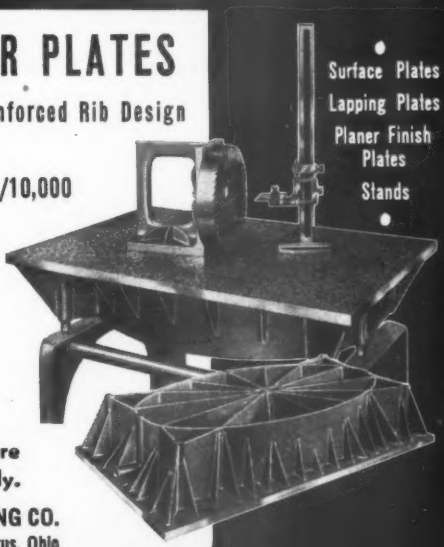
Write for Bulletin WP-22

CULLEN - FRIESTEDT CO.
1316 S. Kilbourn Ave. Chicago 23, Ill.

SMITH MASTER PLATES

* Exclusive Elliptical Reinforced Rib Design
* Maximum Rigidity
* Precision Accuracy to 1/10,000

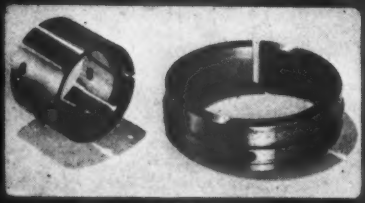
You can best meet the demands for greater accuracy in production inspection with Smith Master Surface Plates. Available in a wide range of sizes from 8x12 to 36x68 inches. Our deliveries are now being made promptly.



Surface Plates
Lapping Plates
Planer Finish Plates
Stands

SMITH TOOL & ENGINEERING CO.
858 N. Sandusky Ave., Bucyrus, Ohio

MAKE
WORK
HOLDERS



OF
TOOL STEEL
TUBING

The piece at the left above is an expansion work holder, and the one at the right is a three-piece collet bushing, both made of tool steel tubing. Either piece, bored from a solid bar of tool steel, would have cost twice as much to make. BISCO tubing saves time, money, manpower and metal.

WRITE NOW!

Learn how to use tool steel tubing in YOUR plant. This free booklet is yours for the asking.

IMMEDIATE
SHIPMENT FROM STOCK

N.E. Steels and Standard S.A.E. Steels, both Carbon and Alloy. Hot Rolled and Cold Drawn • Chisel Steels • Cumberland Ground Shafts • Drill Rod • High Speed Steels • Shim Steels • Tool Steels.

BISCO

THE BISSETT STEEL CO.
945 EAST 67th ST., CLEVELAND 8, OHIO

New Berger Hand Tapper

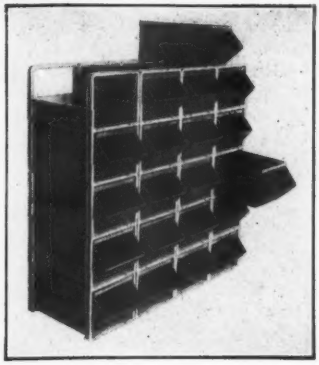
A new and larger Hand Tapper has been added to the Berger line of sensitive hand tappers, designed for tool room use as well as for limited production tapping work. The new tapper embodies all the features of the smaller, highly successful, ¼-inch hand tapper, has a lapped tapping shaft fitted into a lapped

steel bushing and is equipped with a special ½-inch capacity tap holding chuck. Instant use and proper alignment of tap with work is thus assured at all times, even in the hands of unskilled workers.

The table is of ample proportions, being 16" x 16" and is heavily ribbed underneath and ground smooth on top. The upper arm can be swung out of the way, thus offering an additional bench plate when needed. Throat depth is 8" and the weight of the complete unit is 150 pounds.

A novel feature is offered in the right or left hand ratchet device incorporated in, and mounted on top of, the tap spindle. This makes it possible to thread work in a much more convenient way without having to swing the large handle in a complete circle. The operator can thus feed the tap with much more sensitiveness and therefore, less danger of tap breakage. The Berger line of hand tappers is sold exclusively by Tool Specialties Co., Raymond-Commerce Bldg., Newark 2, N. J.

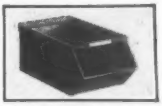
INFORM-A-GRAM KEY No. C34-S



STACKBINS IN STACKRACKS

REDUCE HANDLING of Tools, Parts and Materials

Because Stackbins are portable containers—not fixtures—tools, parts and materials can be carried to departments, from machine to machine, or held in stockrooms without being transferred from one container to another. Stored in Stackracks, any Stackbin is instantly accessible when its contents are needed—without disturbing any other bin.



STACKBINS are individual hopper-fronted stacking bins, designed for storage, transportation and assembly.

STACKRACKS are individual units which lock together to form storage racks of any size, shape or capacity, into which Stackbins slide like drawers.

Manufactured and sold in Canada exclusively by Walter H. Wickware, Ottawa.

WRITE STACKBIN CORP., 97 TROY ST., PROVIDENCE 1, R. I.

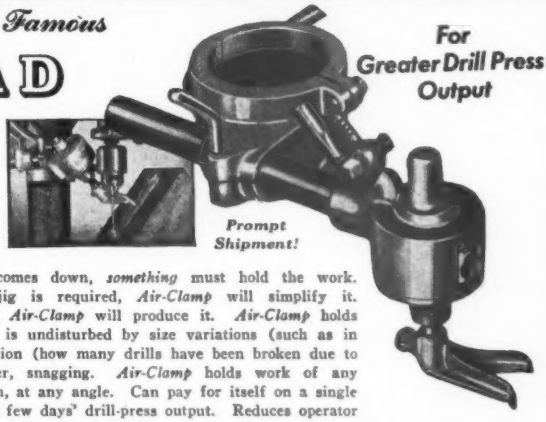
STACKBIN SYSTEM

"Stacked and Still Accessible"

Presenting the Famous

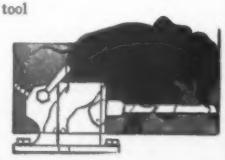
MEAD AIR CLAMP

For Greater Drill Press Output



Prompt Shipment!

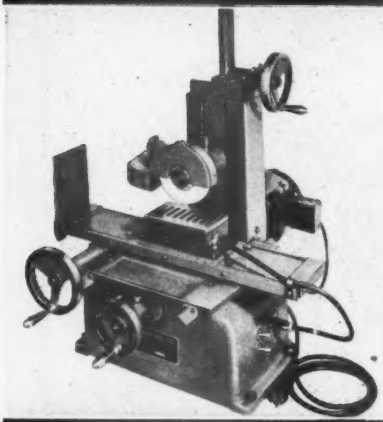
WHEREVER a drill comes down, *something* must hold the work. Wherever a drilling-jig is required, *Air-Clamp* will simplify it. Wherever *speed* is desired, *Air-Clamp* will produce it. *Air-Clamp* holds with relentless pressure; it is undisturbed by size variations (such as in castings), it scoffs at vibration (how many drills have been broken due to faulty hold-downs?), chatter, snagging. *Air-Clamp* holds work of any size or shape in any position, at any angle. Can pay for itself on a single fixture; saves its costs on a few days' drill-press output. Reduces operator fatigue. Saves hours and dollars in drafting-room, jig department, tool room and production line. *Air-Clamp* fits any drill-press having a cylindrical column. Special fixtures for Tee-slotted tables, light milling work, etc. Hand and/or foot control. Shipped on approval to responsible concerns. Write for new Air Power Catalog.



MEAD SPECIALTIES COMPANY

15 SO. MARKET STREET DEPT. 124-HA CHICAGO 6, U.S.A.

SANFORD



High-Speed BENCH
SURFACE GRINDER

ACCURATE WITHIN .0001

A sensitive machine built to rigid standards of accuracy and workmanship specially designed *"For the job that fits in your palm."*

PROMPT DELIVERY

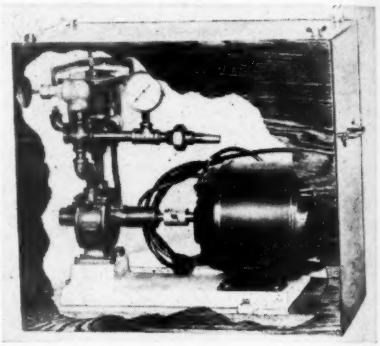
WRITE FOR BULLETIN
Available On M. R. O. Certifications

SANFORD MFG. CO.
1279-81 Springfield Ave.
Irvington 11, N. J.

Air or Gas Testing Units

Announcement of a new portable vacuum and pressure unit for gas or air, to be used in operating many kinds of apparatus for temporary use or for test purposes, is made by Leiman Bros.

These portable units will also handle from 1 up to 5 cubic feet of air and at a pressure up to approximately 10 lbs or



20 inches mercury vacuum. Any purpose for which air or even non-corrosive gas might be used may be very readily accomplished with these light weight units.

Units of this kind may be made as light as from 10 to 20 lbs, which makes them very handy even for permanent as well as temporary installation. They may be furnished as small as about 6" x 10" and as low in height as from 6" to 8".

The units may be equipped with interchangeable motors for various currents found in different sections, and while some are direct connected to the motor shaft, others are operated with equally restricted drives in the form of V belts and grooved pulleys. A very convenient carrying case is supplied, and there are means of controlling the flow of air to or from the pump and at the same time controlling the degree of pressure or vacuum.

Full information will be supplied by Leiman Bros., 141-77 Christie St., Newark 5, N. J., when the complete description of the proposed use for a portable outfit of this kind is supplied.

INFORM-A-GRAM KEY No. 362-S

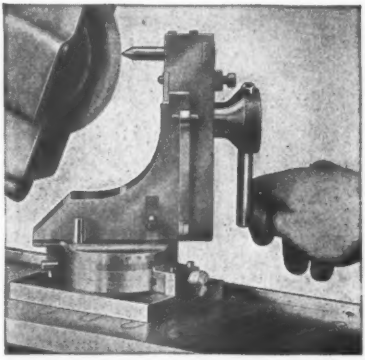
USE

Fluid-motion

for modern form-dressing

ONE SETTING
HANDLE
CONTINUOUS MOTION

The J & S Model "E" Radii and Angle Dresser in the new "Fluid-motion" series is one of the finest precision dressing instruments procurable—regardless of cost.



FEATURES

Fluid-motion dressing
.0001" accuracy
Automatic centering
14" wheel capacity
Large range yet compact
Chatterless and dustproof

J. & S. TOOL CO.

477 MAIN ST. E. ORANGE 4, N. J.

INVENTIVENESS
CRAFTSMANSHIP
and EXPERIENCE

in designing and building special machines and parts

● "That man is most original," said a famous philosopher, "who can adapt from the greatest number of sources."

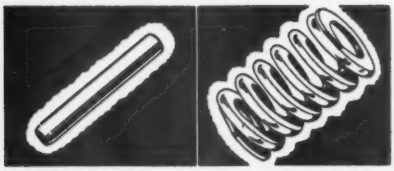
Operating on this principle, MERZ has not limited the scope of its work to a few standardized items, but serves many industries, designing and manufacturing all types of experimental and "pilot model" equipment, special parts, tools, gages and fixtures of most intricate and complicated designs. Tell us what you need, and get our suggestions.

MERZ standard plug and ring gages, of guaranteed accuracy, and in most wanted sizes, are carried in stock for prompt shipment. Literature mailed on request.

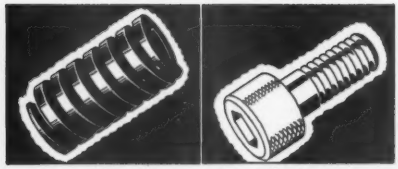
MERZ *Engineering Company*

INDIANAPOLIS 7, INDIANA

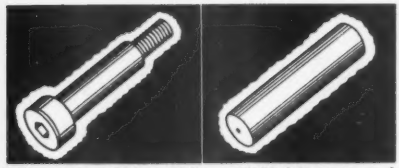
Producto
DIE MAKERS' ACCESSORIES



Dowel Pin | Oval Wire Spring



Square Wire Spring | Socket Head Cap Screw



Socket Head Stripper Bolt | Rubber Bumper

For quick service you can purchase these necessary items for immediate delivery from the following offices and stock rooms:

The Producto Machine Company
990 Housatonic Ave., Bridgeport 1, Conn.
The Producto Machine Company
197 Lafayette St., New York, New York
The Producto Corporation
3017 Medbury Ave., Detroit 11, Mich.
The Producto Company, Inc.
139-141 West 16th St., Indianapolis 2, Ind.
Jamison Steel Corporation
2168 E. Olympic Blvd., Los Angeles 21, Cal.
Jamison Steel Corporation
508 Fourth St., San Francisco 7, Cal.
Valentine Sales Company
1926 S. Malvern Ave., Dayton, Ohio

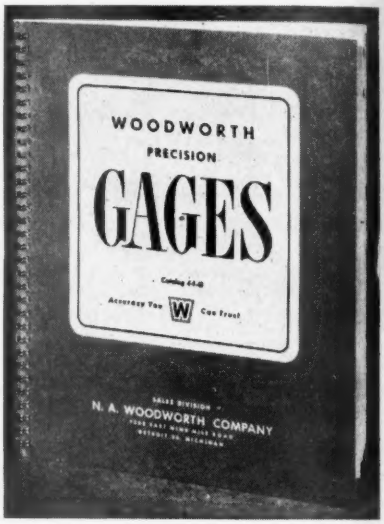
Producto Service on Die Sets and Die Makers' Accessories is nation wide. Contact nearest office and stock room.

THE PRODUCTO MACHINE CO.
BRIDGEPORT 1 • CONNECTICUT

Woodworth Precision Gages

N. A. Woodworth Company, Detroit manufacturers of precision machined parts and precision gages, announces its new Gage Catalog No. 44-G featuring three exclusive new gage developments.

The three special Woodworth products are (1) the Limitrol Gage which performs six visual inspection operations in one; (2) Carboloy Gages with the

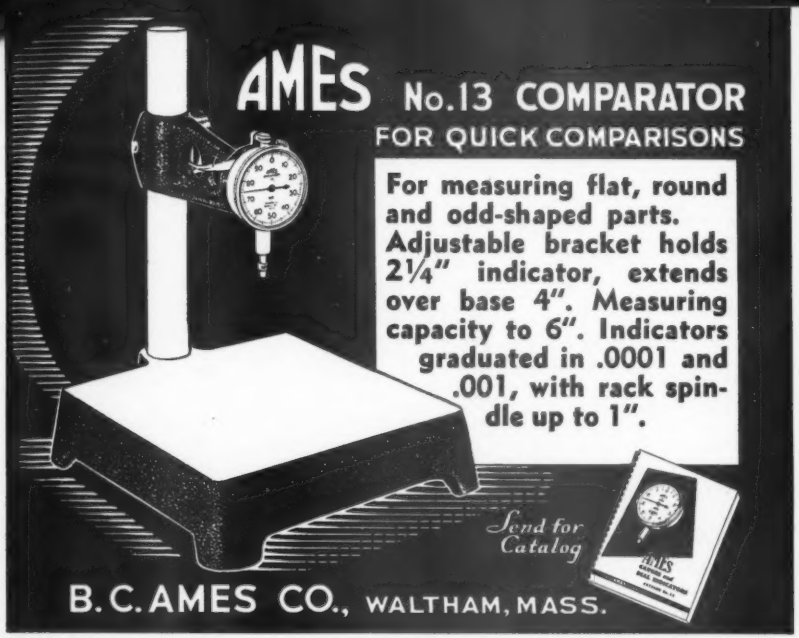


Woodworth Exclusive Segmented Shank; and (3) Gages of Cast Stellite Alloy.

Equally newsworthy to the product introduction is the Woodworth announcement that Catalog No. 44-G lists specifications under H-28 Standards in addition to the H-25 Standards which have been in use since 1938. It is the first time the H-28 Standards data has been published in a manufacturer's catalog. In compiling the book under H-28 Standards the Woodworth Company declared its belief that after the war there will be a general adoption of these standards. Several large corporations have led the trend towards accepting the new specifications.

Among the gages manufactured by the company are: precision thread plug and thread ring gages, plain plug and plain ring gages.

INFORM-A-GRAM KEY No. 926-S


AMES No. 13 COMPARATOR
FOR QUICK COMPARISONS
For measuring flat, round and odd-shaped parts. Adjustable bracket holds 2¼" indicator, extends over base 4". Measuring capacity to 6". Indicators graduated in .0001 and .001, with rack spindle up to 1".
Send for Catalog
B. C. AMES CO., WALTHAM, MASS.

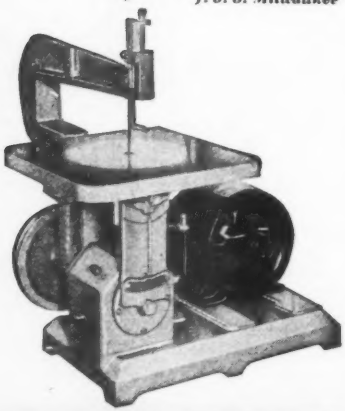
Rawhide PROTECTS
C/R
The tough, resilient, coiled rawhide faces of C/R Hammers and Mallets strike effective blows without battering or marring... protects finished surfaces, machines delicate insulation and parts. Speed die-setting, assembly, no fatiguing re-coil. Reduce breakage and spoilage. Sizes and weights for every need.
C/R Hammers have permanent malleable iron heads which take replaceable insert faces of coiled mechanical rawhide.
CHICAGO Rawhide MFG. CO.
1200 ELSTON AVE. CHICAGO, ILLINOIS

P & H HOISTS for light, intermediate or heavy loads are described in Bulletin H-5 issued by the HARNISCHFEGER CORP., Dept. J, 4400 W. National Ave., Milwaukee, Wis. Adapted to every type of Mono Rail System, they can lift any size load from 15 lbs. to 15 tons.
INFORM-A-GRAM KEY No. 311-S

ATLAS DIE FILER

This sturdy and well designed bench type machine, for rapid and accurate die filing and sawing, will eliminate many costly hand operations.

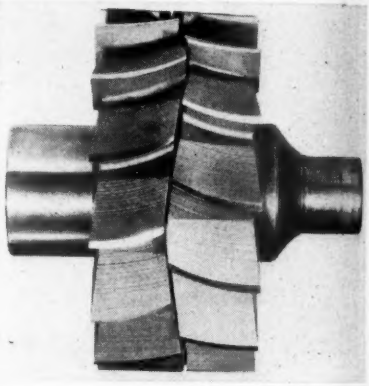
Complete with motor and saw attachment at
$125.00
f. o. b. Milwaukee



Milwaukee Chaplet and Mfg. Co.
1023 S. 40th St. • MILWAUKEE, WIS.

Aber Curved Tooth Milling Cutters

Describing the six types of curved tooth milling cutters produced by the company, new literature of the Aber Engineering Works, Inc., discloses that curved tooth cutters are lowering costs and producing faster and more accurate work in many plants.

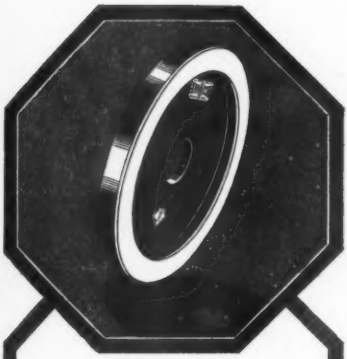


Special features of the Aber curved tooth milling cutters are: the flowing action of the shear cut; higher speeds with coordinated feeds; operates with less friction; longer cutting surface; a stronger tooth; better control in maintaining limits and finish.

The catalog points out that Aber curved tooth milling cutters operate with such ease as to eliminate the jarring impact of the tooth as it cuts the metal. Because it operates so easily it is necessary to increase the speed of the cutter, but it is imperative to increase the feed to coordinate with the speed.

Types of Aber curved tooth cutters are: Woodruff keyway cutters; plain milling cutters; staggered tooth side milling cutters; right and left hand side milling and half side milling cutters, and overlapping side milling cutters.

Illustrated is the Aber overlapping side milling cutter, designed for use when the width of a cut is to be maintained. Complete information about the complete line of curved tooth cutters can be obtained by writing to Aber Engineering Works, Inc., Waterford, Wis.
INFORM-A-GRAM KEY No. 961-S



SECOMET

DIAMOND WHEELS

Resinoid-bonded for grinding of carbide-tipped tools in large quantities. Their extremely fast cutting action provides rapid stock removal. Also for fixed feed, precision grinding operations, such as cylindrical, surfacing, internal and cutter grinding, because of their free and cool cutting action and ability to hold size.

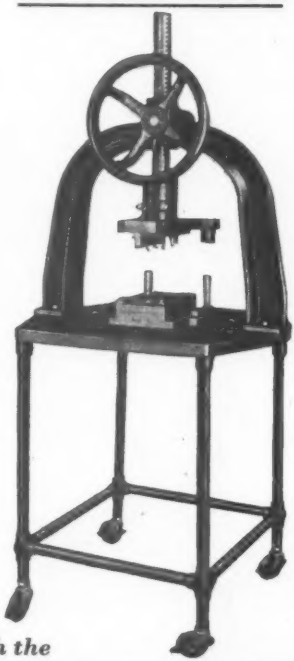
Metal-bonded for off-hand grinding, where the cutting surface is sometimes subjected to extreme abrading action.

Catalog on request.

J. K. SMIT & SONS

157 Chambers St. New York 7 N Y 6400 Tremont Ave. Detroit 9 Mich

COMPLETE THE DIE-SET AT YOUR BENCH



with the

LACEY DIE-SET MACHINE

Here is a truly "one man" press that operates with one hand and under full manual and visual control.

Handy for tool and press rooms, it permits the diemaker to complete a die-set *right at his bench* . . . saves toolroom and handling costs.

Positive, true punch to-die alignment is assured at all times, thanks to the Lacey's sturdy, open construction. And punches can be removed as often as needed without disturbing alignment once the die-shoe is clamped to the table and punch holder fixed in position in the ram. No pry bar or hammer is needed to separate punches.

The Lacey Die-Set machine is sensitive for delicate work yet rugged enough for fitting up heavy die-sets. Useful, too, for shearing certain types of punches.

Write today for complete details.

Sole Distributors

MOORE SPECIAL TOOL CO., INC.

740 Union Ave. Bridgeport 7, Conn.

BURKE
MILLING MACHINES

No. 4 Motor Driven MILLING MACHINE Mounted on Cabinet Column

Burke motor driven milling machines Nos. 1, 2, 3, and 4 are specially suited for handling small, difficult work on a production basis.

Write for complete information.

Burke Machine Tool Co.

301 E. 16th St. -:- Conneaut, Ohio

New Improved Gusher Pump

By utilizing recent wartime developments in compact and efficient motor design, scientific balancing methods, and careful and accurate workmanship, The Ruthman Machinery Company of Cincinnati, Ohio, in response to machine tool requirements for greater tank capacity and utility of floor space, has designed and put into production the Gusher Model HL-15025-B Deep Immersion Pump.

This pump is available in two lengths, 19" and 23" immersion below the high level line of the coolant reservoir. The mounting bracket is a circular flange type, 10½" in diameter, and is an integral part of the unit, making installation extremely simple.

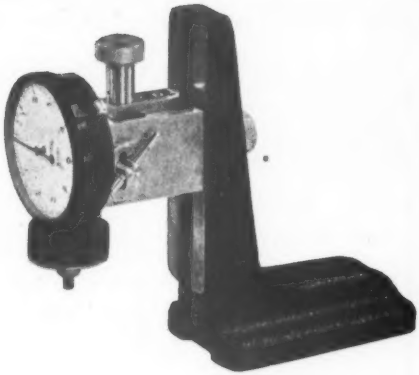
The entire rotating assembly is on a one-piece extended steel shaft, electronically balanced after assembly, and mounted in the motor on sturdy precision ball bearings. Every unit, after final assembly, is thoroughly tested to assure vibrationless and long trouble-free operation. This new model, like all Gusher pumps, has no packing glands nor metal-to-metal contacts below the high level line. This elimination of mechanical friction assures a generous, adequate flow of coolant with a minimum of power consumption and attention.

Model HL-15025-B is available with ¼ hp motor for continuous duty and ½ hp motor for extra heavy duty, in standard current specifications. A copy of their new catalog can be obtained by writing The Ruthman Machinery Co., 1823 Reading Rd., Cincinnati 2, Ohio, or by use of our

INFORM-A-GRAM KEY No. 318-S

BARTELT
NEW MODELS
OF PEDESTAL INDICATORS
FOR TOOL SETTING

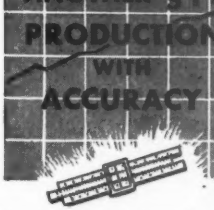
New Model "D" Bartelt Pedestal Indicators are designed for gaging from flat surfaces such as machine tables, surface plates, magnetic chucks, and the like. For approximate setting, the carriage block is clamped where desired on the upright, and the dial indicator is then adjusted to exact position on the face of the carriage block with a micrometer screw, and clamped separately. Model "DNF-10" is made of non-ferrous metals for freedom of movement in a magnetic field. Model "DF-10" is made of iron and steel for all conventional uses. Write today for prices and full particulars.



BARTELT
ENGINEERING COMPANY
1212-M PARTRIDGE AVENUE
BELOIT • WIS.

Get our illustrated Bulletin "D"

THE Zagar SPEED CHUCK
ANOTHER STEPPER-UPPER OF PRODUCTION WITH ACCURACY



Used wherever collets are standard equipment. Ideal for turning bar stock, facing off and second operation turning. Can be mounted on any lathe, grinder or rotating spindle; can be loaded and unloaded while machine is running; operating independently of spindle rotation, can be mounted on face plate and be indicated to run dead true regardless of spindle run-out. COLLET DOES NOT MOVE; face-off and length dimensions on second operation work can be held to close limits. 1" and 2" sizes.

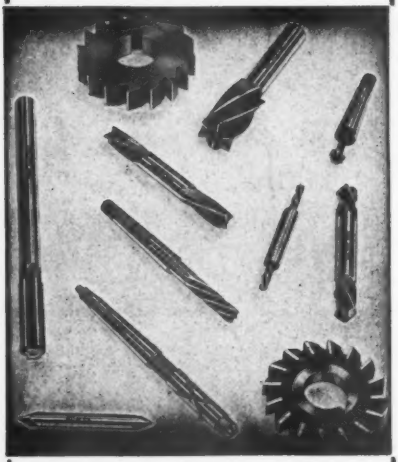
ZAGAR TOOL INCORPORATED
23890 Lakeland Blvd. Cleveland 17, Ohio

ZAGAR COLLET TOOLS
Zagar COLLET FIXTURES
INDEXING HOLDING

Inexperienced operators "make out" quickly

IMMEDIATE DELIVERY
FROM STOCK
On Standard Sizes

GALTER
HIGH GRADE TOOLS



DEPENDABLE
PERFORMANCE
Guaranteed

Plain Milling Cutters
Side and Face Milling Cutters
Stagger Tooth Side Milling Cutters
Shell End Mills
Slot Cutters
Taper Shank Cutters
Spiral End Mills
Counterbores
Countersinks
Reamers
Hollow Mills
Taper Shank Drills
Straight Shank Drills

PROMPT DELIVERY ON SPECIAL TOOLS, DIES, JIGS AND FIXTURES MADE TO YOUR EXACTING REQUIREMENTS

Write for prices on standard sizes or submit blueprints for quotations on special sizes.

Galter Manufacturing Co.
711 W. Lake Street - Chicago, Ill.

Tool Steel Tubing Applications

Tool steel tubing, a material used to eliminate the boring operation in the manufacture of tubular or ring-shaped tool steel parts, has proved successful in the making of expanding arbors. Shown here is such an arbor, assembled at the left, and exploded at the right. The slotted sleeve in the center is made of tool steel tubing as are the straight

and tapered rings shown on the shaft and beside it.

The arbor sleeve is 13⅛" long, 6⅞" OD, and 4" ID, with six slots—three at either end, milled from ¼" holes bored in the wall. In milling, a narrow tie bar was left at the edge of the sleeve until after heat treating, to prevent distortion, and was then cut through with a rubber abrasive wheel. This part is capable of .050" expansion, achieved by drawing up on the nut and forcing the tapered parts toward the center of the arbor. The latter parts are made by grinding a 13° taper on rings of tubing to correspond with the internal taper of the sleeve.

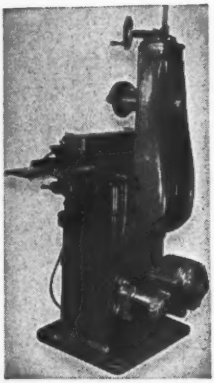
This tool was previously made of a solid bar of carbon steel, bored out, machined and carburized, but this method was expensive and the material unsatisfactory. The tool steel parts wear much better. For additional tool steel tubing information, write the Bissett Steel Company, 945 E. 67th St., Cleveland 8, Ohio.
INFORM-A-GRAM KEY No. 603-S

TO IMPROVE PERFORMANCE . . .

equip your surface grinders with

MASTERDRIVE

. . . it's simple . . . it's complete



By eliminating complicated pulley arrangements and costly lineshaft maintenance, Masterdrives power surface grinders for maximum efficiency and economy.

Masterdrives for surface grinders are engineered as complete units ready to install. No machine work needed. Proper belt tension is maintained at all times.

For information on Masterdrive for your grinders, simply state the make. Masterdrives are supplied in 750 specifications for practically every machine tool drive requirement. Phone, write, or wire today!

THE MASTER ELECTRIC CO.
INDUSTRIAL EQUIPMENT DIVISION · DAYTON, OHIO

BUILDERS 'T' SURFACE GRINDER

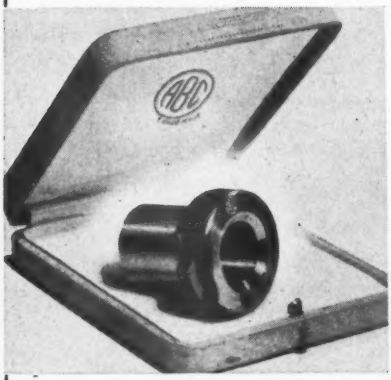
SMALL
RUGGED
USEFUL

Builders hand operated 'T' Grinder is the "Jeep of the toolroom". Small in size, it does the work of large, expensive machines. Rugged construction assures years of odd job precision grinding or production surfacing.

BUILDERS
IRON FOUNDRY
23 Codding St.
Providence 1,
R. I.

Prompt delivery.
Send for Bulletin 644

JEWELS OF PRECISION



A. S. A. STANDARD DRILL JIG

BUSHINGS

Prompt Delivery from Stock

- HEADLESS PRESS FIT
- HEAD PRESS FIT
- FIXED RENEWABLE
- SLIP RENEWABLE
- HEADLESS LINERS

also

SCREWS • CLAMPS
LOCATING JIGS

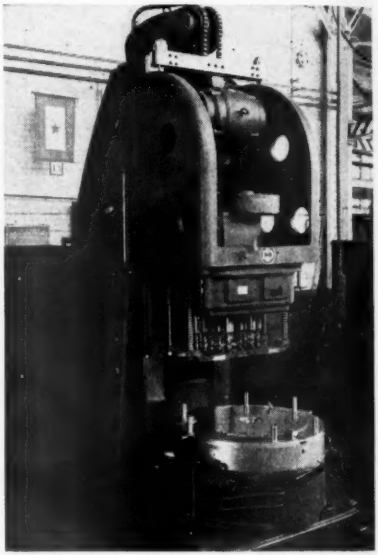
Send for New Catalog No. 243

ACCURATE BUSHING COMPANY
447 NORTH AVE., GARWOOD, N. J.

Heavy Duty Driller

The new Defiance No. 540 vertical hydraulic feed machine, designed for heavy duty single or multiple drilling, boring, reaming, or milling operations, is manufactured by Defiance Machine Works, Inc., Defiance, Ohio.

The column is a heavy-type cored



casting with long ways which carry the slide. The hydraulic feed cylinder which operates the head is supported by the column, which also encloses the head and slide counter-balance weights.

The machine is provided with an automatic cycle of rapid approach, feed, (adjustable) rapid return to stop. The head is driven through multiple "V" belt and provided with one pair of pick off change gears to give a speed of from 200 to 500 RPM.

Driller has a 28-spindle head and fixture for drilling $\frac{11}{32}$" holes in large diameter plates $\frac{3}{4}$" and $\frac{3}{8}$" thick. For this operation, there is a 42" 3-station indexing table which has a ball thrust bearing on the end of trunnion bearing, and each time the index pin is disengaged, table is elevated slightly by a lifting device, permitting table to be indexed readily.

INFORM-A-GRAM KEY No. 140-S

Season's Greetings

We extend our best wishes for the coming year, with the hope of an early victory. Whether for war production or peacetime purposes, Master Gauge stands ready to serve your requirements.

GAUGES, DIES, JIGS, FIXTURES

Prompt Delivery Now on
THREAD PLUG GAUGES

MASTER GAUGE CO.

2218 FENKELL AVENUE, DETROIT 21, MICHIGAN Phone: University 3-7676

Here's a Practical Guide for Tool and Die Makers

Written in easy-to-understand shop language, this practical guide is packed with usable information on steel selection, tool making, heat treating, furnace atmosphere, "trouble shooting", and testing techniques.

Widely used in toolrooms and machine shops throughout the country, TOOL STEEL SIMPLIFIED helps to improve tool performance and cut costs. It meets the urgent need for an authoritative, inexpensive handbook for all those who are responsible for the design, making, or heat treating of tools.

TOOL STEEL SIMPLIFIED
By FRANK R. PALMER
Vice President of The Carpenter Steel Company
315 *Pages* 205 *Illustrations*
$1.00 *Postpaid* (U.S.A.)
Elsewhere $3.50

MAIL TODAY

THE CARPENTER STEEL COMPANY
Reading, Pa. **Dept. J**

Please send me postpaid a copy of TOOL STEEL SIMPLIFIED. I enclose $1.00 ($3.50 outside the U. S. A.) in full payment for the book.

*Name*_____ *Title*_____

*Firm Name*_____

*Mailing Address*_____

*City*_____ *Zone*____ *State*_____

PLEASE PRINT

New Push-Out Collet Chuck

A new two-inch size push-out type collet chuck is announced by Hall Manufacturing Co., Dept. T, 622 Tularosa Drive, Los Angeles 26, Calif. The push-out design eliminates latches, fingers, cams, dogs or delicate parts. The Hall chuck locks or unlocks by a slap of the hand on the operating lever which builds up a tremendous grip by compound leverages. The chucks are suited for use on threaded spindle lathes and grinders.

The two-inch Hall collet chuck, like the one-inch size, allows full spindle capacity or over. They can be moved from lathe to lathe, even of different spindle size, by employing an adaptor nut. Work may be reset without stopping the lathe and it remains practically chip free even when boring on second operations.

The Hall chuck is a precision tool (.001 or better when properly mounted), designed to speed up production and improve accuracy of multiple operations on high alloy steels, dural or plastics. Full details are available from the manufacturer.

INFORM-A-GRAM KEY No. B47-S

ANGLES
"TO A MINUTE IN A MINUTE"
THE BEMISINE
SPEEDS UP AND SIMPLIFIES SETTING ANY ANGLE FROM 0 TO 90° — USING ONLY A 2" MICROMETER! * IT HOLDS THE WORK! FASTER THAN A SINE BAR OR PROTRACTOR! CONVERTS SET-UP TIME TO PRODUCTION TIME ON SURFACE GRINDERS, JIG BORERS & MILLERS.
* ALSO USED WITH STANDARD GAGE BLOCKS

Colored Finishes Now Permitted on Machine Tools

A variety of color finishes on metalworking equipment, such as ammunition and cartridge case machinery, lathes, planers, bolt, nut, rivet and screw machinery, and machines for drilling, forging, gear cutting, sawing, etc., have been permitted after November 29, by an amendment to the WPB's Limitation Order L-108 according to the Tools Division of WPB. Since May 1, 1942, Order L-108 has restricted the color of metalworking equipment to "old machine-tool gray" for final paint, enamel or lacquer coatings, notwithstanding customers' requests for other colors.

The manpower saving involved in the order justifies its retention until "V-E" Day, division officials said and it continues to restrict the number of coats of paint, enamel or lacquer on metalworking equipment. The order now permits application of only one coat of primer or sealer, and not more than two coats of paint, enamel, or lacquer. No filler may be applied to smooth out irregularities in metal surfaces, according to the order. The amendment will permit manufacturers to finish their machines in preferred lighter colors, which increase light intensity at the working levels of machines and provides greater safety for workers.

SHOP AIDS

or YOU and YOUR JOB!

Use our postage-free Inform-a-Gram for your requests

NEW POST 1945 WEEKLY CALENDAR features elephant size dates and a 56-page weekly pad. In accordance with recommendations from draftsmen and engineers the new calendar has two big advantages over the extremely popular Post 1944 calendar; (1) The giant weekly dates all on one line are larger than ever, easier reading, and (2) Large figured previous and following months are shown on each page. Built on a war week basis the big black numerals can be easily read from any part of the drawing room. The over-all size is 15¾" x 24½". A section of technical data for the engineer and draftsman, containing charts on wire and sheet metal gauges, screw threads, etc., is included.

Enclose a dollar with your request or add your request to an order for any other Post merchandise and the calendar will be furnished gratis. Address all requests to The Frederick Post Co., Dept. TD, Box 803, Chicago 90, Ill.

FREE PAMPHLET GIVES TIPS ON SPANISH LANGUAGE—To help promote closer relations between the Americas through an exchange of language knowledge, the Pan American Society has prepared a free pamphlet containing simple rules for acquiring a rather extensive smattering of the Spanish language with a minimum of study and effort.

The Division of Inter-American Relations reports that hundreds of Pan American Clubs have been formed in United States junior and senior high schools as well as colleges. The adult public, however, has not been afforded such opportunities for learning Spanish as are to be found in educational institutions. Throughout South America, hemispheric minded newspapers and magazines are carrying regular lessons in English.

Although it is not generally known, more than 300 Spanish and English words are spelled exactly the same. Simple rules for changing the endings of thousands of English words, automatically convert them to Spanish words of similar meaning. It is possible, then, for the average North American, whether of school age or adult years to acquire a rather extensive understanding of Spanish, through learning which English and Spanish words are identical in spelling, and which English words may be readily converted to Spanish by the easy expedient of changing the endings.

The Pan American Society has prepared a free pamphlet which describes the words and endings referred to above. The pamphlet was prepared by Professor Senor Don Arturo Montesinos M., especially for free distribution in North America. Senor Montesinos is professor of English at the Colegio Militar, Ecuador's "West Point."

Applicants for the pamphlet on Simplified Spanish, need only to send their names and addresses to Pan American Society, Box 315, Quito, Ecuador, South America.

SAFETY RULES for the operation of power industrial trucks are printed on a pocket-size cardboard folder, with rounded corners and varnished surfaces for greater durability. Each of the 34 safety ideas is presented as a brief suggestion followed by a short explanation or discussion, and they are applicable to the operation of all makes and types of power trucks. Copies are available from the Elwell-Parker Electric Co., Dept. TJ, 4205 St. Clair Ave., Cleveland 14, Ohio.
INFORM-A-GRAM KEY No. 284-S

MEEHANITE COLOR FILM—The Meehanite Research Institute of America, Inc., Dept. T, Pershing Square Bldg., New Rochelle, N. Y., has available for use by interested societies or groups a motion picture entitled "The Flow of Metal into Molds."

The film, in color, shows the action of molten metal as it is poured into molds of various sizes, shapes and complexities.

Prints will be loaned upon request. This film consists of two reels and is for 16 mm. projection without sound.

SELF-TAPPING SCREW GUIDE. Much useful engineering and production data about the application of Self-tapping Screws is given in the new Users' Guide, offered by Parker-Kalon Corp. to design engineers, chief draftsmen and production executives. The eighteen pages are file size, tab-indexed, spiral bound and arranged with a strong wall hanger. The guide includes a selector chart which tells at a glance which of nine types of self-tapping screws to use in various materials. Clear tables give recommended hole sizes, stock sizes and data on use of each type of P-K self-tapping screw under different conditions. Application information covers use of self-tapping screws in sheet metal, steel, castings, plastics, plywood, asbestos and other compositions. Also shown are special heads and special forms of P-K self-tapping screws which can be made for specific needs. Because of the paper shortage, and the costliness of the unit, distribution must be limited to engineering and production executives, who can obtain copies of Users' Guide from Parker-Kalon Corp., 204 Varick St., New York 14, N. Y.
INFORM-A-GRAM KEY No. 423-S

HOBS AND HOBBING—A major contribution to available literature on hobbing has been published and made available to tool engineers and shop men in the Dominion by Colonial Tool Co., Ltd., of Windsor, Ontario, in the form of a striking 2-color, 48-page booklet entitled "Hobs and Hobbing" (Bulletin No. H-44). This company manufactures all types of cutting tools and is reported to be the largest producer of hobs in the Dominion.

The book—which contains a wealth of information on hobbing and hobs for cutting all types of gears, splines, etc.—is divided into four sections, the first of which treats with hobbing in general. Included in this section are instructions on the proper method of setting up a hob, directions for the accurate checking of the hob mounting, and corrections to apply if errors are noted. Important hobbing machine requirements and considerations are also discussed to assist the shop man in eliminating possible errors due to machine conditions and operation. Helpful tables of suggested hobbing feeds and speeds are included, although they are offered mainly as a guide to what may be considered average practice.

MECHANICS PREFER IT...

The UNBRAKO KNURLED Socket Head Cap Screw

Mechanics prefer it because the knurling of the head prevents time-wasting finger-slip and lost motion. Oily fingers become geared to the knurled head, enabling the screw to be turned farther and faster by hand before a wrench is needed. These savings really mount up. Sizes from No. 4 to 1½" diameter. Full range of lengths.

Knurling of Socket Screws originated with "UNBRAKO" years ago.

Send for the "Unbrako" Catalog

ARMY E NAVY

OVER 40 YEARS IN BUSINESS

STANDARD PRESSED STEEL CO.

JENKINTOWN, PENNA. BOX 600

BRANCHES

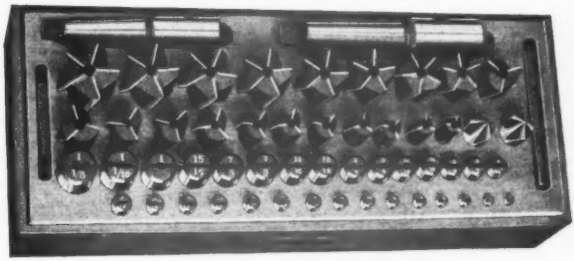
BOSTON • DETROIT • INDIANAPOLIS • CHICAGO • ST. LOUIS • SAN FRANCISCO

Gairing TOOLS Counterbore Sets

A kit of these efficient tools eliminates costly delays in counterboring and spotfacing. Seven sets from which to choose. Each contains a logical selection of interchangeable counterbores, pilots and holders. *Write for prices and Bulletin C.*

Set C-13, below, consists of 2 holders, 20 cutters ranging from 9/16" to 1¾" and 28 pilots ranging from 9/32" to 1⅛". Two countersinks, ⅞" x 70° and ⅞" x 82° are included, all neatly boxed with hard wood cover.

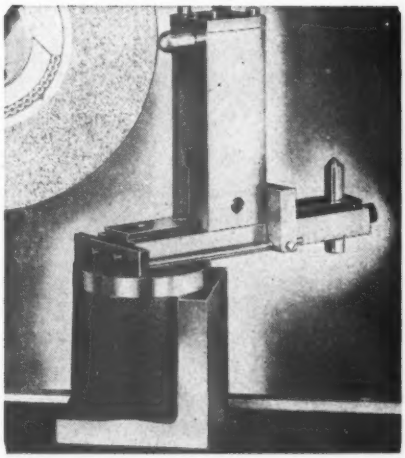
THE GAIRING TOOL CO., Detroit 32, Michigan



THE "FORM-MASTER"

ANGLE & RADIUS DRESSER

A sturdy, quality instrument designed by form-grinding specialists to dress both angles and radius at low cost. Two 1/3 ct. diamonds and instrument case included—$150.00 complete.



Features

Large range.
Chatterless and dustproof.
.0001" accuracy obtainable.
Simple to operate.
Reasonably priced.

Call your supplier or write

J. & S. TOOL CO.

477 MAIN ST. E. ORANGE 4, N. J.

SHOP AIDS

Numerous practical and valuable hints on the proper method of sharpening hobs are given in the second section, together with desirable grinding wheel characteristics, shapes, grain, and grades. Hob maintenance to insure faster cutting, lower power consumption, longer life, more accurate work, and better finishes are discussed in this second section.

The third section of the book—dealing with hobs in general—includes a useful reference sheet on hob terminology generally used in describing and ordering hobs. There is a discussion, too, on when to use "A" tolerance and when to use "B" tolerance hobs. A comprehensive table gives both "A" and "B" limits for single thread ground finishing gear hobs as produced by Colonial Tool Co., Ltd. A list of all the details to include when ordering different types of hobs to insure obtaining the correct hob for a specific job, and to save time in correspondence, etc., is given.

The fourth division of the new hobbing book is given over to a description of the complete line of roughing, finishing, and semi-finishing hobs available from Colonial Tool Co. These include standard spur and helical gear hobs; stub tooth gear hobs; pre-shave hobs; taper hole hobs; fine pitch gear hobs; hobs with restricted diameters; spline shaft hobs for straight sided keys; worm gear hobs; tangential and infeed types; etc.

The many excellently reproduced photographs; annotated drawings of hobs; tables; and the clear and concise text should make this a book which will be a welcome addition to the tool engineer's or shop man's reference shelf.

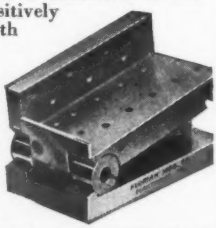
INFORM-A-GRAM KEY No. C40-S

NON-FERROUS FORGINGS DIGEST—Publication of a new bulletin, Non-Ferrous Forgings Digest, is announced by The Brass Forging Association, Dept. J, 420 Lexington Ave., New York, N. Y. It will be issued periodically. Copies are being mailed to corporations interested in non-ferrous forgings and anyone desiring to be placed on the mailing list for the inaugural issue dated October and subsequent copies can do so by writing to the Association. The members of the Association are: Accurate Brass Co., Brooklyn, N. Y.; Chase Brass and Copper Co., Waterbury, Conn.; Mueller Brass Co., Port Huron, Mich.; Bohn Aluminum & Brass Corp., Detroit, Mich.; Harvey Metal Corp., Chicago,

Sine ANGLE PLATE

FOR CHECKING AND GRINDING EXTREMELY ACCURATE ANGLES

Simple operation with gage blocks, sine table and formula (sine × 4 + 0.300″) gives any angle from 0 to 90 deg. . . . with accuracy to 4 millionths in one inch . . . and positively maintains it with split-bearing locking screws. A hardened and ground complete unit of plate and base, packed in attractive case.



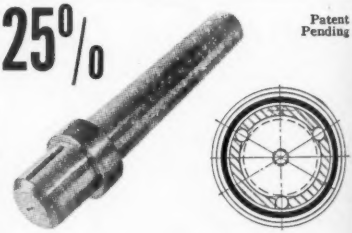
Available *now.*

Made by Florian Mfg. Co., Plantsville, Conn.

DISTRIBUTED BY
AMERICAN STANDARD CO.
SOUTHINGTON, CONNECTICUT

25%

Patent Pending



Young Mandrel

"Roller Clutch Expansion"

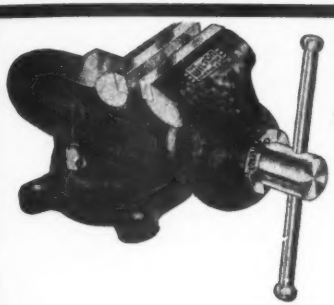
Boost your high production 25%. This self contained unit requires no wrenches, "C" washers or power operated draw bars. Work locks automatically when placed on the mandrel. Work will not slip or jam. Young Mandrels require no adjustments.

Concentricity is maintained in LOW TENTHS for the entire length of the work.

Use Young Mandrels for any machining operation. Sizes 1″ to 4″, any desired mounting.

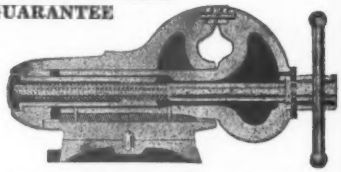
Send drawings of part and mandrel in use. Good delivery schedules.

YOUNG ARBOR COMPANY
3257 Bradford Road, Cleveland Heights 18, O.



BENCH VISES

UNRESTRICTED 5-YEAR GUARANTEE



- **Less Weight, yet greater efficiency.**
- **Absolute Precision.**
- **Every part interchangeable.**
- **Indestructible.**

▼

Write for Literature

Sizes & Prices

Sizes 2", 3", 4", H.D., 4½" H.D. and 6" were built to conform with Federal Specifications GGG-V-436, as required by Army, Navy, etc.

Width of Jaws	Maximum Opening	Approximate Weight	Price with Swivel*
2"	2¼"	4½ lbs.	$10.40
3"	4½"	21 lbs.	12.80
3" H.D.	4½"	30 lbs.	15.80
4"	5¼"	37 lbs.	18.60
4" H.D.	7"	47 lbs.	21.00
4½"	5¼"	39 lbs.	21.30
4½" H.D.	8½"	55 lbs.	27.50
5"	8½"	58 lbs.	33.60
6"	9½"	106 lbs.	62.00

Regularly furnished with Serrated Jaws. Can supply smooth steel, brass or copper jaws.

*Subject to Discount

ACME TOOL COMPANY

196 CHURCH STREET NEW YORK 13, N. Y.

Precision Built

REAMERS

for Precision Work

On aircraft . . . small arms . . . instruments . . . motors . . . engines . . . radio . . . or ANY part that calls for extreme reaming accuracy . . . we are specially equipped to produce reamers . . . built to precise, exacting standards . . . and give you remarkably rapid delivery.

STRAIGHT
SPIRAL
STEP
PILOT
HAND

Sizes starting from .030 diameter

METAL CUTTING TOOLS AND MANUFACTURING CO.

11121 GRAND RIVER AVE. • DETROIT 4, MICH. • HOGARTH 9164-5

Ill.; Revere Copper and Brass, Inc., New York, N. Y.; and Scovill Manufacturing Co., Waterbury, Conn.

In describing what non-ferrous forgings are the Digest states:

"Non-ferrous forgings are produced by a highly technical and industrially exacting hot working in hammers and presses of suitable slugs cut from ingots or rods. The result is a strong, dense metal product closely approximating the shape and size of the finished item, thus assuring a minimum of scrap metal in the final processing operations. Such forgings are furnished either cleaned, trimmed, pierced, sized and otherwise freed of excess forging material and ready for machining or further finishing and fabricating operations; or as the finished or machined forging completely processed, ready for use as an item of itself, such as a nut or a tee, or for incorporation in an assembly, such as an item of automobile hardware."

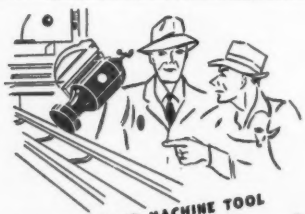
On the front page of the October issue is depicted the evolution of a brass forging from the original slug cut from brass rod through seven other steps to the final machined forging. There are also many other illustrations and descriptive material of various types of forgings and their manifold uses. On the back cover page is listed a data table, the first of a series. This table gives the composition, density, tensile strength, elongation, Rockwell hardness and best annealing temperature of Forging Brass, Naval Brass, Leaded Naval Brass, Manganese Bronze, Muntz Metal and Silicon Bronzes, Types A and B.

Information on non-ferrous forgings can be obtained by writing either the Association or any of its member companies.
INFORM-A-GRAM KEY No. C41-S

ALLIS-CHALMERS GAS TURBINE MOVIE—The gas turbine, newest source of prime power, makes its motion picture debut in a film released by Allis-Chalmers Mfg. Co. entitled "Tornado in a Box." Explained in motion pictures for the first time are the development and operation of this unit which has been hailed as "the power plant of the future."

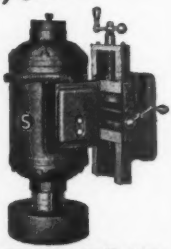
Taking a cue from the extremely wide popularity of the gas turbine, the movie unfolds the story of the gas turbine in a manner which will make its principle readily understandable to the largest possible audience which could be interested in the potentialities of a new prime mover. At the same time, the film frankly indicates that a great deal more of the tremendous engineering effort already applied must still be put into gas turbine development before such potential success can be achieved.

The film, which contains no advertising, is



"RIGHT! YOUR MACHINE TOOL CAN NOW SERVE YOU AS A (STANDARD) GRINDER TOO."

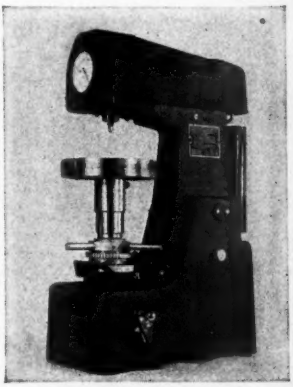
YES SIR! You can now make your machine a "double purpose" machine, the "Standard Way". STANDARD VERTICAL SPINDLE GRINDERS can be easily mounted on your Planers, Boring Mills, Shapers, Milling Machines, etc., giving you added profits! Available with or without feeds, as preferred.



Write for Your copy of Catalog 48, today.

The STANDARD ELECTRICAL TOOL Co.
CINCINNATI, OHIO
Mt. Hope & Sixth St.

"ROCKWELL" HARDNESS TESTER *Immediate Shipment*



THE NEW "J" MODEL

383 Concord Ave. Bronx 54, N. Y.
WILSON MECHANICAL INSTRUMENT CO. INC.
An Associate Company of American Chain & Cable Company, Inc.

HY-TEN

AISI SAE NE

Alloy Steels For Victory

Scientifically selected to conserve critical alloys and meet the requirements of the AIRCRAFT, ORDNANCE, and MACHINE TOOL industries.

Complete "EARMARKED" stocks of Aircraft alloy steels at Buffalo and Detroit.

WHEELOCK, LOVEJOY & CO., INC.
138 Sidney Street
CAMBRIDGE 39, MASS.
Cleveland 14, Chicago 23, Newark 5, Detroit 3, Buffalo 10, Cincinnati 32

A TOOL KIT IN ONE TOOL!

Illustration is Model No. 4 with a ½" shank, 2⅛" to 4" expansion capacity and ⅜" thickness capacity.... $25.00

One Clark Adjustable Hole Cutter Replaces a Whole Tool Kit of Fixed Radius Cutters.

You have a tool crib at your elbow when you're using Clark Cutters. Gives a smooth finish the first time without filing or de-burring in steel, hard fibre, plastics, wood and other materials. Models cover variable expansions from ¾" to 5" holes and have thickness capacities from thin sheets to 1".

Clark Hole Cutter is simple to adjust, yet performs more efficiently than fixed radius cutter of same size.

In portable electric drill, Clark Hole Cutter easily cuts steel plate as well as pipe, plastics, hard fibre, Transite, etc.

Write for complete catalog TDJ-12 *and call your Clark Cutter Jobber today.*

CLARK CUTTERS
Robert H. Clark Company
6310 SANTA MONICA BOULEVARD BEVERLY HILLS, CALIFORNIA

being loaned free to any industrial or engineering group interested in showing it, and permanent prints may be purchased. It is a 16 mm film, for use on sound projectors only.

"Tornado in a Box" is the third of a series of educational films released by Allis-Chalmers, the first being "The Magic of Steam", a story about the steam turbine, the second, "The Surface Condenser."

To borrow or purchase "Tornado in a Box" or the other films, write the Allis-Chalmers Mfg. Co., Milwaukee 1, Wisconsin.

Universal Drill Bushings

Back in 1919 Universal Engineering Company originated the idea of standard drill bushings. Today, 25 years later, on their silver anniversary, Universal has grown from a small shop to a full fledged leader in the drill bushing field. Other Universal products include standard collet chucks, floating chucks, centering chucks, boring chucks, boring bars, grippets and plungers. Write today for catalogs on any or all of these precision made products.

CROMOVAN TRIPLE DIE STEEL—Cromovan, a high production die steel used for cutting and forming dies such as trimming, blanking, stamping, cold-forming, extrusion, drawing, swaging, pressing, thread-rolling, coining, shearing, compressing, slotting dies and many other similar purposes is pictorially described in an informative booklet recently published by the Firth-Sterling Steel Co., Dept. TJ, McKeesport, Pa.

Its high abrasive resistance, unusual depth of hardenability and good machinability in the annealed condition are a few of its outstanding features. It can be hardened with practically no change in size or shape and is almost entirely free from warping and shrinking. Air-hardening and oil-hardening data, working methods and specific examples of proper techniques are included along with information and instructions covering pack-hardening and forging. Cromovan Triple Die Steel is a safe steel to harden as very little distortion results from the heat-treatment, permitting accuracy in the finished die or tool.

Typical applications of Cromovan are shown. It is also used and recommended for some types of punches, rolls, plug gauges, ring gauges, taps, burnishing gears, bushings, reamers, broaches, lathe centers, spinning tools, shear blades and many other special operations where conditions are unusual. In the annealed state this steel will show a Brinell Hardness of approximately 210, and will machine without difficulty.

INFORM-A-GRAM KEY No. 10-S

CALCULATOR FOR WELDING PREHEATING TEMPERATURES. A new calculator, designed for readily determining the welding preheating and interpass temperatures of steels in those few cases where experience indicates the need for preheating to obtain best welding results, is being offered by The Lincoln Electric Co.

This useful calculator is 6¼" in diameter and consists of four movable discs of heavy cardboard stock. Complete instructions in six simple steps are printed on the outside.

Although most steels are readily weldable and require no preheating because of low carbon and alloy content, this calculator will serve as a convenient guide in instances where steels have a higher content of carbon and other alloys and require preheating to minimize the tendency toward excessive hardening and possible cracking of the base metal adjacent to the weld.

The calculator, available through The Lincoln Electric Co., Cleveland, Ohio, is priced at 25 cents, postpaid, anywhere in the United States; 50 cents elsewhere.

NO. C WIRE ROPE CUTTER

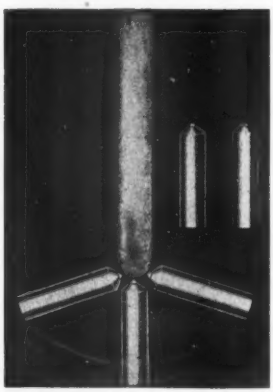
Hand operated, lever action, will cut 1″ or smaller wire rope. The compactness and durability of this tool make it particularly adaptable for shipyard and field work.

Price $80.00 ★ Weight: 110 lbs.

Immediate Shipment

T. H. LEWTHWAITE MACHINE CO.
314 East 47th Street New York 17, N. Y.

ALL MACHINE SHOPS NEED DIAMONDS



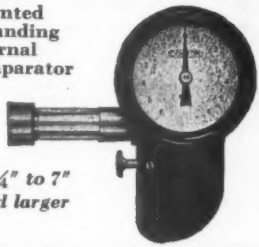
The Chisel Point Diamonds for Radius Dressing out-wear pin point diamonds 50 to 1. As illustrated above in ⅜ holder. Price $6.00. Send for Booklet T. D.

SOMERSET INDUSTRIAL -DIAMOND CO.
220 VIRGINIA STREET HILLSIDE, N.J.

"Matched Gaging" to fractions of .0001″ with

COMTORPLUG

Patented Expanding Internal Comparator



Sizes: ¼″ to 7″ dia. and larger

By combining high precision with unique simplicity, Comtorplug enables operators, bench inspectors and final inspectors to use the same gage, improving quality and lowering rejects. Shows actual size; detects out-of-round, front or back taper, barrel shape, bell mouth, etc.

Request Bulletin 29

THE COMTOR CO.
82 Rumford Ave. Waltham, Mass.

RussCo

PURPLE LAYOUT DOPE

for Tool . . . Die . . . Pattern or Template Layout and Check Lines on Castings. All lines show up Clear . . . Sharp . . . and well defined.

The best Layout Dope on the market { Gallons . . . . . $ 2.50 / Quarts 90

Buy from the originator. Order direct or from your local supply house.

RUSS SIMPSON COMPANY
1826 East Congress Street • Detroit 7, Michigan

EASY MOUNTING
Large Quill
4" Travel
(counter balanced, hardened and ground)
6 SPEEDS
250-3000 RPM
Lever and Worm Feeds
½ H. P. Motor

Specially engineered by RUSNOK to meet the demand for heavier duty end mill operations. Uses many types of cutters on a wide range of work. Large size spindle (No. 9 B & S taper). Takes ⅛" to ⅝" end mills. Precision Engineered and Ruggedly Constructed Throughout.

Write for descriptive folder.

RUSNOK TOOL WORKS
4840 North Avenue, Chicago, Ill.

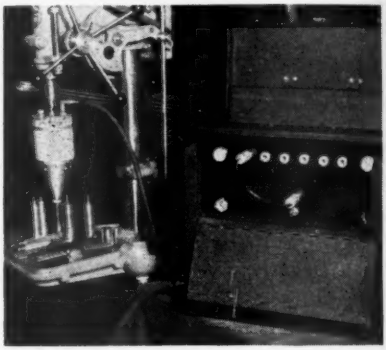
The rugged GREENFIELD No. 4 Tool & Cutter Grinder is serving industry as an invaluable production and tool-room machine. The spindle design of the new and improved GREENFIELD Wheel Head incorporates generous bearing areas—scraped to fit and thoroughly run in. Quickly and easily set up attachments provide tool-room versatility for grinding formed cutters, taper and rose reamers, flat surfaces and compound angles. Send for detailed and illustrated job application bulletin.

PRODUCTION MACHINE CO.
GREENFIELD, MASS.

Thomas Disintegrator

The critical needs of war production have stimulated and spurred developments in the salvage and repair fields that are demonstrating their inevitable carry-over into subsequent postwar production economy.

One of the most critical problems is that of removing broken tools that have become imbedded in costly and nearly finished work pieces. The latest method of effecting recovery in such cases is by electrically disentegrating the core of the tool which permits the collapse and scavenging of the remaining fragments of its outer shell.



The Thomas "Hand Portable" Model does the same work as the "Super" model but requires a separate drill or arbor press on which to chuck the head. Both models have the same safety features, self-ventilating head and electrical features. Head, coil and all electrical parts are protected by an automatic resistance cutout. The heads are fast-cutting, having a fine tension adjustment for all diameter electrodes thus maintaining a uniform and fast cutting speed at all depths. Both models operate on 110 volt, 60 cycle current and are fused at 20 amps.

Equipment that utilizes this technique, the Thomas Tap Extractor, is made by the Clinton Machine Co., Dept. TD, 8240 Harper Ave., Detroit 13, Mich. The equipment embodies a hollow electrode which is allowed to intermittently contact the center portion of the broken tool by means of a vibrating head which is solenoid controlled. With each break of the circuit "make and break" an arc

Take a Load off Your Men's Backs

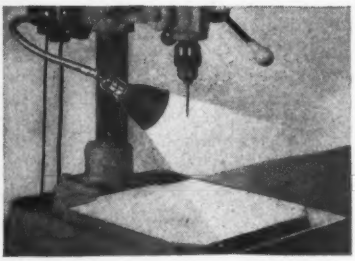
PORTELVATOR (Portable Elevating Table)

Lift—push—fetch and carry—use as work bench—or for overhanging work—PORTELVATOR saves miles of steps and many dollars of costs.

THE HAMILTON TOOL CO.
Ninth and Hanover Streets.
HAMILTON OHIO

Write for details

VIMCOLIGHT



SEE BETTER!

Do A Better Job

Reduce eye fatigue and you encourage faster production, with fewer rejects. VIMCOLIGHT preserves the EYE-POWER of machine tool operators because it spotlights the work with glareless, diffused illumination and *cancels out the shadow menace.* Versatile . . . adjustable . . . VIMCOLIGHT can be bent, moved and attached almost anywhere. Used on many leading machine tools.

Vimco Manufacturing Co.
117 Chenango St. Buffalo 13, N. Y.

The Newest in Cutters

THE WONDER:
CUTS—Wire and Rods up to ⅝ in. Rd.
CLIPS— Band iron up to ⅛ x 2 in.
MEASURES— Length of pieces.

The lowest priced wire and band cutter on the market. Every Shop, big or small can use a WONDER CUTTER.

Write today for further information and prices.

THE FEDERAL FOUNDRY SUPPLY CO.
4608 East 71st St., Cleveland, Ohio

LEACH EXTERNAL GRINDER

Grinds work from ¾" to 11" in length and from ⅛" to 7" in diameter

Send for Descriptive Literature

EXCELLENT DELIVERIES

PRICE $875.00 Fully Equipped

Write us today for your nearest dealer's name and address.

Exclusive Selling Agents
H. LEACH MACHINERY CO.
387 CHARLES ST. PROVIDENCE, R. I.

Agents in all Principal Cities Throughout the World

NUMBERALL

SPEED NUMBER MARKING

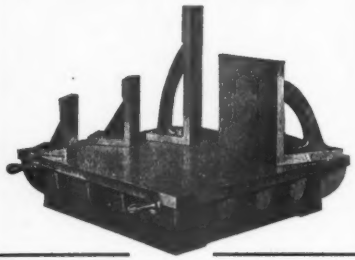
New Spanner Wrench facilitates much faster turning of wheels.

MODEL 70 NUMBERALL MULTI-WHEEL MACHINES

stamp numbers, etc., quickly ...neatly. Perfectly aligned. Shank for Hand or Press and with any number of wheels from 3 to 20. Write for Bulletin TD 70.

NUMBERALL STAMP & TOOL CO.
HUGUENOT PARK STATEN ISLAND 12, N. Y.

MILWAUKEE
Surface Plates

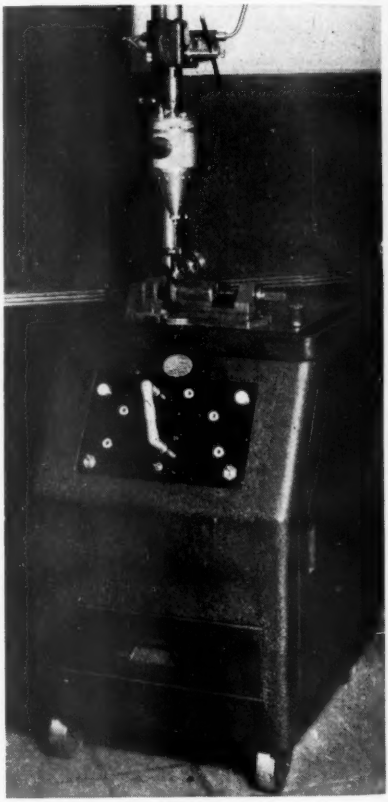


A full line of surface plates, angles and box parallels. Standard plate sizes from 8″x 8″ to 48″x 96″, larger sizes with or without legs. Plates are finish-planed and scraped to insure a very accurate surface.

Write for details

J. C. BUSCH CO.
Engineers & Machinists Since 1907
172 SO. FERRY ST., MILWAUKEE, WIS.

is struck which produces a localized area of high heat at the core of the broken tool. This results in rapid oxidation of the core metal which, in combination with the severe contraction due to the continual quench by a flood of coolant from the hollow electrode, results in the shattering or disintegration of the core



The "Super" model of the Thomas Tap Extractor is completely self-contained in a steel cabinet having a ground bench plate production table with gutter for coolant return. This model requires no separate drill or arbor press and can be moved to any part of the shop. Head can swing 360° around 27″ column. Precision spindle tilts through 180°.

"STAR DUST"

LABORATORY GRADED

PURE DIAMOND POWDERS

STAR DUST speeds up production enormously and produces finishes and superfinishes down to less than .0000004 of an inch.

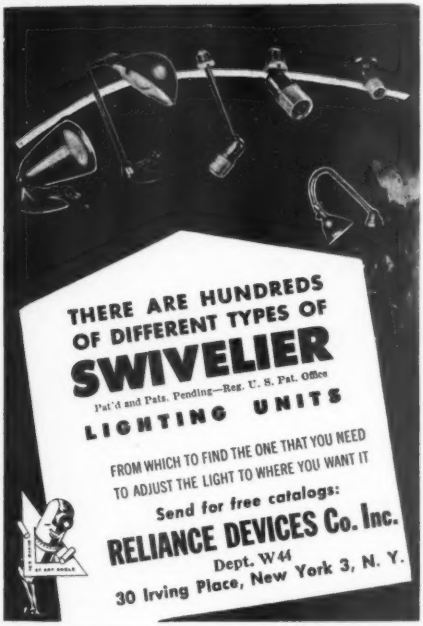
Precision LAPPING POWDERS for PRECISION work

For GAUGES, TOOLS, DIES, etc., with tremendous TIME SAVING. These factors make STAR DUST indespensable in lapping and superfinishing on HARDSTEELS, TUNGSTEN CARBIDE, CHROME.

- Absolute control of particle sizes
- Complete absence of out-size particles
- STAR DUST sizes as fine as .0001"
- Complete range of grit sizes

There is a STAR DUST Field Serviceman in your territory.

ACE ABRASIVE LABORATORIES ONE SPRUCE STREET NEW YORK 7, N. Y.


THERE ARE HUNDREDS
OF DIFFERENT TYPES OF
SWIVELIER
Pat'd and Pats. Pending—Reg. U. S. Pat. Office
LIGHTING UNITS
FROM WHICH TO FIND THE ONE THAT YOU NEED
TO ADJUST THE LIGHT TO WHERE YOU WANT IT
Send for free catalogs:
RELIANCE DEVICES Co. Inc.
Dept. W44
30 Irving Place, New York 3, N. Y.

5000 SHAPES and SIZES GROBET Swiss Files

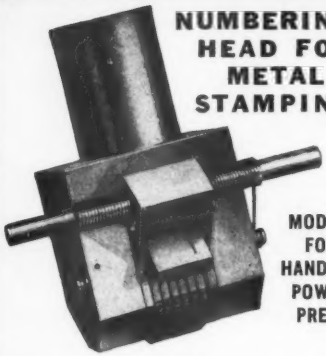
Ask for Catalog YF

The most complete catalog of its kind. Lists 5000 different shapes, sizes and cuts of GROBET Precision Swiss Files. Ask also for catalog YM on files for filing machines.

Learn more about these Chrome Steel Files that have won a reputation for utmost precision and durability—since 1812.

GROBET FILE CO. OF AMERICA, 421 Canal St., New York 13, N. Y.

Plants: New York, Chicago, Los Angeles



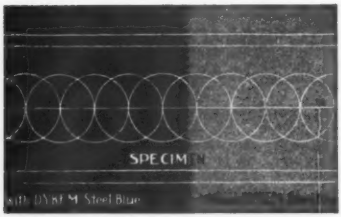
NUMBERING HEAD FOR METAL STAMPING

MODELS FOR HAND OR POWER PRESS

Combines strength with precision — the 143 Numbering Head does all types of metal indenting including the heaviest kind of power press work. Its simple design and clean-cut engraving guarantee sharp, true impressions. Adjustable for "consecutive" or "repeat" action, right or left hand operation. Available in 6, 7, and 8 wheel models, with Gothic or Roman type, as desired.

Write for Literature

MARKING EQUIPMENT
ADOLPH GOTTSCHO, INC.
190C DUANE ST. NEW YORK 13 N.Y.



DYKEM STEEL BLUE
STOPS LOSSES
making dies & templates

Simply brush on, ready for the layout in a few minutes. The dark blue background makes the layout lines show up in a sharp relief, and at the same time prevents metal glare. Increases efficiency and accuracy.

Write for full information.

THE DYKEM COMPANY
2201 N. 11th STREET ST. LOUIS, MO.

metal, the particles of which are constantly washed away by the coolant. The heat that is created is confined to the area contacted by the electrode thus eliminating any danger of annealing, distorting or burring adjacent surfaces of the work.

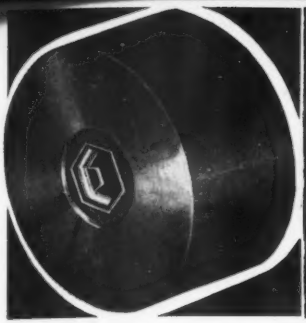
The hollow electrode (and vibrator head) can be chucked in a conventional drill press or incorporated in any setup whereby it can be fed to the broken tool body. The Thomas head can be used at any angle from horizontal to vertical and even completely inverted. The electrodes are non-ferrous and range in size from .040" to .312". The special coolant is filtered and runs in a closed circuit. The transformer included in the setup furnishes current over a voltage range of from 2 to 12 volts which is harmless. The working temperature at which the Thomas Tap Extractor performs the job of disintegrating imbedded tools is only approximately 130° F so there is no danger of distorting the work piece in the process of removing broken high speed tools.

The work from which the broken tool is to be removed is clamped to the table of the machine and the suspended electrode or tip is centered over the broken tool. Electricity and coolant are brought into play and the tip is lowered to contact the work. The disintegration then begins, and, with no further adjustment, proceeds at an average rate of $\frac{1}{32}$" per minute. The specific rate depends upon the size of the tool to be removed and the material.

Applications of the Thomas Extractor are not limited to the removal of broken tools. Holes can be "disintegrated" thru hardened or case hardened steel parts in those too frequent cases where hole drilling had been forgotten before hardening or where supplemental specifications call for a hole after the work has been through the heat treat.
INFORM-A-GRAM KEY No. C35-S

★

SUMP TANK CLEANING is described in a series of leaflets distributed by the W. R. CARNES CO., Dept. D, 2066 Helena St., Madison 4, Wis. The Model "70" is a combination sump tank cleaning machine and centrifugal filter. Model "20-T" is a compact portable unit designed for easy handling by one operator. Model "50" cleans coolant removed for re-use.
INFORM-A-GRAM KEY No. 728-S



HARTLEY

TUNGSTEN CARBIDE

Special DIES *Shaped*

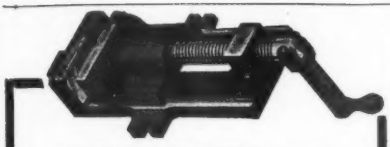
No need to worry about facilities for fast and reliable production of special-shaped dies—that's the specialty of the Hartley Wire Die Company.

Skilled workmen combined with extreme manufacturing care and most critical inspection assure you dies of the high quality you require, and the prompt service you desire.

"From blueprint to finished product"—that's Hartley service. Just send us the prints of the dies you require; no problem is too tough, no job too large or small. Every assistance we can give is yours.

HARTLEY WIRE DIE CO

14 ELM STREET THOMASTON, CONN.



YOST DRILL PRESS VISE

This new Yost vise has been designed expressly for use on drill press operations. Does away with special and costly jig fixtures.

Offered in two sizes.

Vise No.	Width of Jaw, Inches	Opens Inches	Weight Pounds
1D	3½	3½	12½
2D	6	5½	23

Do you need a vise of ANY type?

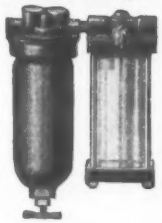
Write today for bulletins on the extensive Yost line

YOST MFG. COMPANY

1000 MAIN ST.

MEADVILLE, PENNSYLVANIA

M·B AIR-LINE FILTER *and* AUTOMATIC LUBRICATOR



Removes 95% to 97% of All Water, Dirt and Scale from Airline.

AIR passes through a series of brass discs with .002 spacings, providing the finest degree of filtration obtainable. Then as the air passes through head of Lubricator, oil is delivered into the purified airline in any desired volume. The scarcity of replacement parts makes the use of these devices doubly important.

A combination of this kind is only as efficient as the filter unit of the assembly.

Write for Literature

Representatives in Principal Cities

M·B PRODUCTS

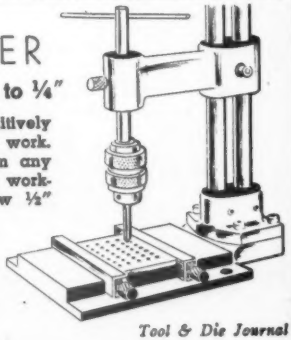
130-134 E. LARNED ST.
Detroit 26, Michigan, U.S.A.

BERGER

SENSITIVE HAND TAPPER

for hand tapping of delicate threads, from #0 up to ¼"

This handy device is precision-built and jig-bored and will positively eliminate expensive tap breakage or spoiled holes on costly work. The lapped spindle and guide assures perfect alignment in any position of the tap. The tapper comes complete with two work-holding jaws and special tap chuck. Also available: New ½" Hand Tapper, for larger and heavier work.



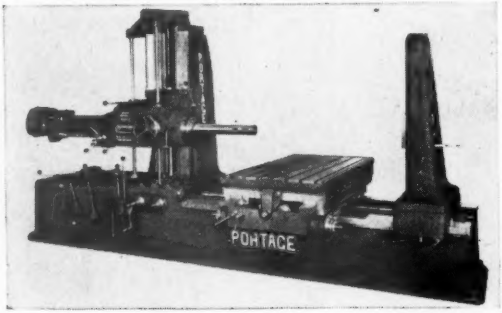
TOOL SPECIALTIES CO.

RAYMOND-COMMERCE BLDG. NEWARK 2, N. J.

PORTAGE

4 INCH BAR HORIZONTAL BORING, DRILLING & MILLING MACHINE

ROTARY TABLES



ACCESSORIES

- Designed and built to meet the need for speed and accuracy demanded of today's production.

WRITE TODAY for fully illustrated bulletin giving detailed description of the many features of this Horizontal Boring, Drilling and Milling Machine. No obligation.

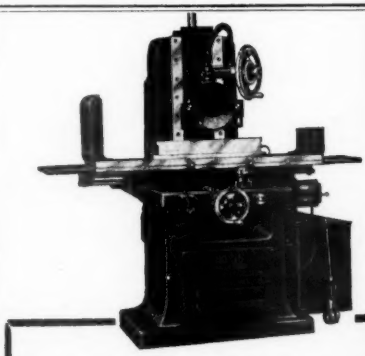
THE PORTAGE MACHINE COMPANY
555 Miami Street, Akron 11, Ohio

ARMSTRONG SETTING-UP TOOLS

This is no time for machines to stand idle, while good tool makers rummage through the scrap heap for setting-up materials or waste vauable time fashioning makeshift setting-up devices. Equip all planers, shapers, milling machines, drill presses and special machines with ARMSTRONG SETTING-UP TOOLS—Planer Jacks, Bracing Jacks, "T"-Slot Bolts and Drop Forged Strap Clamps that reduce setting-up time to a minimum, hold work and jigs rigidly, prevent delays, accidents and spoilage and stand up for years.

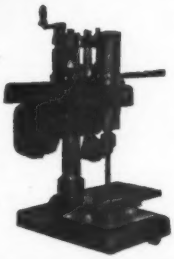
ARMSTRONG BROS. TOOL CO.
"The Tool Holder People"
340 N. Francisco Ave., Chicago 12
Eastern Warehouse & Sales: 199 Lafayette St., New York

Write for Circulars



Grand Rapids Surface Grinders are the result of over thirty years actual experience in the building of precision grinding equipment . . . A patented vertical head adjustment is featured. When using the circular Vernier reading for extreme accuracy, the graduated circular plate can be set at zero in relation to the pointer extending inward from the rim of the large hand wheel. The pointer will travel in the same direction as the small inner hand wheel, but at 1/6th the speed . . . Attractive and amply illustrated Bulletin GL-100 is available.

GALLMEYER & LIVINGSTON CO.
304 Straight Ave., SW Grand Rapids 4, Mich.



PRECISION DRILLING AT ITS MOST EFFICIENT

for holes .004 to 5/16" dia.

The HAMILTON MUEHLMATT Super Sensitive DRILLING MACHINE

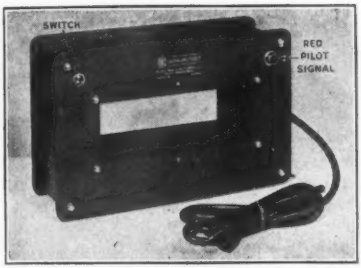
Let the HAMILTON save on production costs, time, worry when you need tiny holes. For airplane work, Diesel, instrument panels . . . any precision drilling.

THE HAMILTON TOOL CO.
Ninth and Hanover Streets,
HAMILTON OHIO

Write for Bulletin V

AMC DEMAGNETIZER

A Tool Room Necessity



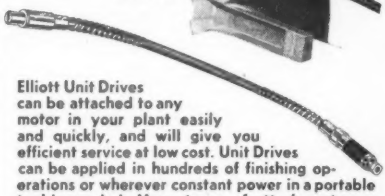
Every tool room needs this simple, portable, sturdy demagnetizer. Small parts passed through the powerful AMC field are instantly demagnetized. Large, flat surfaces can be demagnetized by sliding the device over the surface.

Available for either 115 V. or 220 V.

Write for full information.

ALOFS MFG. CO.
1619 Madison Ave., S. E., Grand Rapids, Mich.

CONVERT ANY MOTOR *into a Flexible Shaft Machine with an* **ELLIOTT UNIT DRIVE**



Elliott Unit Drives can be attached to any motor in your plant easily and quickly, and will give you efficient service at low cost. Unit Drives can be applied in hundreds of finishing operations or wherever constant power in a portable tool is needed. Many types of attachments can be used.

Investigate the advantages of the Elliott Unit Drive . . . write for Bulletin 44A giving complete information and prices.

ELLIOTT MANUFACTURING COMPANY
201 PROSPECT AVE BINGHAMTON N Y

DIAMONDS *for Production*

RE-SET-ABLE • BIG-HED-NIB

(Trade Marks Registered)

Actual Size Photo
3 Carat Size—Common
1/4" Shank—$36.00 ea.

LOC-KEY-SET
by Patented Process
U. S. Pat. 2,351,741

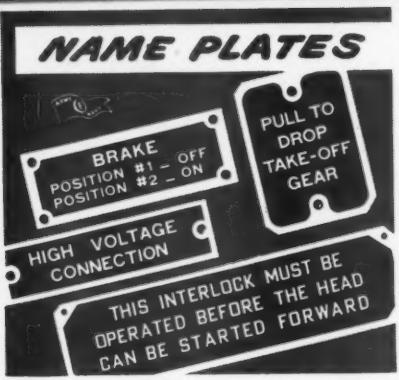
16
Factory Branches
Jobbers
Everywhere

● **RE-SET-ABLE** adds to life of your diamond . . . More work per carat. Exclusive patented setting is tender to the diamond . . . Holds firmly . . . Protects from damage . . . Guards against breakage.
No. 24 CN RE-SET-ABLES are now selling in 100 lots. Ask for easy No. 4 Catalog and Grinder's Instruction Card. Shows sizes to fit your machines. Tools backed by service unequalled.

All diamonds are LOC-KEY-SET for immediate shipment . . . Tools numbered in units of 1/5 carat (No. 1 size) and lettered to denote quality of diamond and style of mounting . . . 3 grades—Common (C), Medium (M), Select (S). (24-hour resetting service $1.00 postpaid.) Bigger stones in C grade are genuine economy in diamond use. For large wheels we recommend **No. 60-CN.**

Equip Now with "RE-SET-ABLE"
Diamond Tools on Your Precision Grinding Production Line

DIAMOND TOOL COMPANY, Not Inc.
SHELDON M. BOOTH, Pres.
938 E. 41st Street, CHICAGO 15, Ill.


NAME PLATES
BRAKE
POSITION #1 – OFF
POSITION #2 – ON
PULL TO DROP TAKE-OFF GEAR
HIGH VOLTAGE CONNECTION
THIS INTERLOCK MUST BE OPERATED BEFORE THE HEAD CAN BE STARTED FORWARD

Modern Messengers in

ETCHED METAL OR PLASTIC

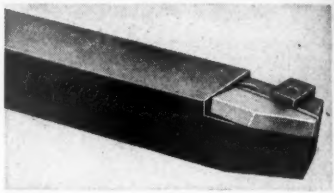
Name plates, dials, scales, panels. Eastern Etching's prompt deliveries help speed your war production. Normal deliveries —Two Weeks. Emergency orders—48 hours. Tool checks, data & instruction plates, dials, scales, instrument panels, etched & lithographed products. ***For complete details write—***

EASTERN ETCHING AND MFG. CO.

CHICOPEE, MASS.

New Kennametal "Clamped-On" Tools

Kennametal Inc. of Latrobe, Pa., is now producing a line of "H.D." tools having clamped-on and advanceable Kennametal tips for heavy duty machining on steel castings, forgings and bar stock, and cast iron. This design feature has been made possible by the development of heavy-duty Kennametal



tips that, while overhanging the tool shank by about $\frac{1}{16}$", have ample strength for heavy feeds and cuts.

The special type of Kennametal tip used in the H.D. tool has a clamping surface along the top of the side opposite the cutting edge. It is diamond ground on the under side. When dull, the tip is advanced, and resharpened. The tip may be reground many times, since it is advanced to the front and side, in the oblique recess, until the major part of it has been utilized. Only the cutting edge is ground, and no shank steel is removed in the process. The recess in the hardened steel shank is finished plane and true with a Kennametal-tipped fly cutter, or a Kennametal end file. The clamp and set screw, positioned to avoid abrading, permit a smooth and unimpeded chip flow.

Use of Kennametal H.D. tool permits minimum tool stocks, since one shank serves for the life of many tips, and the proper grade of Kennametal tip can be used for each job. Heavy-duty Kennametal tips are available in grades KM and K3H for general steel-cutting, grade K2S for machining steel castings where scale is encountered, and grade K6 for cast irons. H.D. tools are made in several styles in the larger sizes, i.e., those with shanks 1" wide or more.

INFORM-A-GRAM KEY No. 33-S

★

Are you familiar with the "Know-How" Library? See Page 224 for complete details.

Die & Tool Makers

DESIGNERS AND MANUFACTURERS OF DIES · TOOLS · GAUGES · JIGS AND SPECIAL MACHINERY

J. J. BARTH, President

GLENN A. BARTH, Gen'l Mgr.

THOMAS A. BARTH, Sales Mgr.

BARTH STAMPING & MACHINE WORKS CLEVELAND, OHIO

JOHN A. BARTH, Chief Engineer

ROBERT A. BARTH, Superintendent

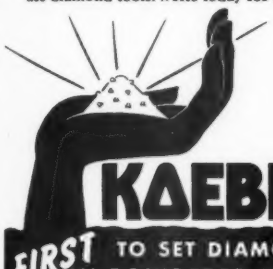
BARTH STAMPING & MACHINE WORKS

DENISON AND WEST 74TH STREET CLEVELAND, OHIO

Diamond Tool

COST CONTROL

The Koebel Library of Conservation Information is available to help reduce the ultimate cost of your diamonds. Practical employee training literature on how to use diamond tools. Write today for details.



FIRST TO SET DIAMONDS IN POWDERED METAL

KOEBEL DIAMOND TOOL CO.

9444 Grinnell Ave., Detroit

P S C

Tool and Die Steels

Drill Rod

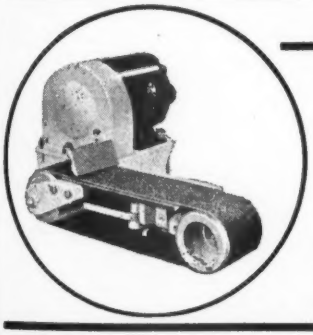
Cold Finished Steels

Steel plus Service

The PENINSULAR STEEL Co.

CLEVELAND: 2227 Lakeside Ave., Phone: CHerry 7173

CHICAGO · DAYTON · DETROIT · GRAND RAPIDS · TOLEDO



HIGH SPEED GRINDING

STANDARD D-4 ABRASIVE BAND GRINDER

This new, streamlined bench type grinder assures fast, quality finishing on metals, plastics, wood, fibre . . . at low cost. Built to machine tool specifications, Standard D-4 is equipped with improved band tension control and specially designed protective motor hood. 4x36¼" band. The ideal portable unit!

Other styles and sizes in New Manual on Finishing — Write Today

WALLS SALES CORP.

97 Warren Street New York 7, N. Y.

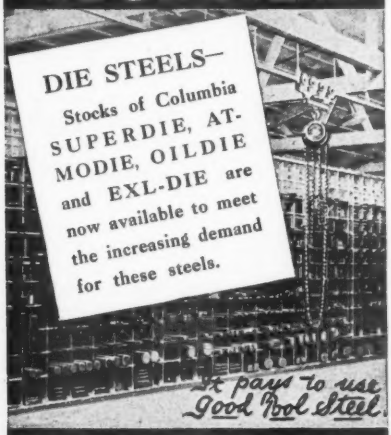
Accuracy lasts longer with new J-83 Gage Block Set!

TWO wear blocks of tough tungsten carbide protect the surfaces of the 81 alloy steel blocks. That's why the Jansson J-83 set of precision gage blocks stays accurate longer. Makes 120,000 gages in steps of .0001" from .200" to over 12". Accuracy guaranteed to .000008", .000004", or .000002".

For precision gage blocks, calipers, height gages, sine bars, tri-squares, and special gages see Jansson, "The House of Precision", first. Write for additional information.

JANSSON GAGE COMPANY
19212 GLENDALE AVE., DETROIT 23, MICH.

Columbia TOOL STEEL


DIE STEELS—
Stocks of Columbia SUPERDIE, ATMODIE, OILDIE and EXL-DIE are now available to meet the increasing demand for these steels.
It pays to use Good Tool Steel.

COLUMBIA TOOL STEEL COMPANY
ARTHUR T. LLARAGE, PRESIDENT
MAIN OFFICE AND WORKS
610 EAST 14TH STREET • CHICAGO HEIGHTS, ILL.

Numberall Spanner Wrench

Numerall Stamp & Tool Co., Dept. T, Huguenot Park, Staten Island 12, N.Y., announces a new wrench for Model 70 Numbering Machines. This is a spanner wrench which provides a special,

fool-proof groove for turning the numbering wheels. The wrench is recessed and fits into space between wheels and its hook engages the character on the wheel, without slipping off, thereby saving considerable time.

INFORM-A-GRAM KEY No. 602-S

★

How Did You Do?

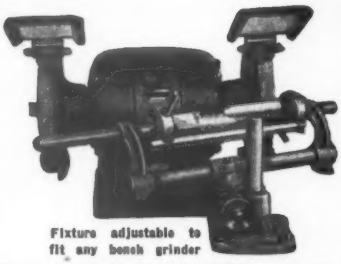
(from TDJ, November 1944, Page 114)

1V	2A	3R	D		4C	5U	L	L	M	6A	N
7I	C	E			8H	P				N	
9N	R	A			U		10A	11P	12O		13E
14C	O		15P	16A	R	17A	M	O	U	18N	T
O		19D	U	T	C	H		20I	R	O	N
	21B	A	R	T	H		22A	N	S		A
23F	O	N	D	A		24A	C	T		25A	
	26B	L	A	C	K		M		27C	B	28I
29B		Y		K		30T	E	N	O	R	S
31O	32S		33N		34D	O			35L	A	
36A	L	37L	I	38S	O	N			39D	D	40S
41T	O	O	L	I	N	G		42U	S	E	R

MINN-KOTA TAP GRINDING TOOL

With HOLDING Fixture for Bench Grinder

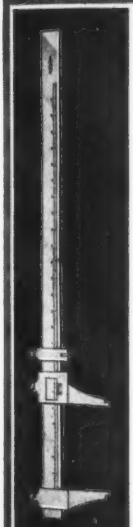
This inexpensive equipment quickly saves its cost. You can regrind old, worn taps repeatedly and make them cut like new again. Grinds any desired chamfer and relief uniformly on all flutes of plug or taper taps, right or left hand. Send for circular.



Fixture adjustable to fit any bench grinder

MINN-KOTA MFG. CO., Dept. 905, FARGO, N. D.

PRECISION TOOLS



McGRATH ST. PAUL CO.

VERNIER CALIPERS

The McGrath Vernier Caliper has an adjustable head and jaw, making possible any two Vernier adjustments at any point on the scale. The adjustable end jaw is a time saver and eliminates inside measurement errors.

This instrument can be set up on machine tools, surface plates, or other appliances wherever two limits are necessary.

Write for our new complete Precision Tool catalog.

Address, Room 312.

McGRATH ST. PAUL CO.

5th & Wacouta Streets
St. Paul 1, Minn.

Darwin

NEOR

The Original Oil Hardening Non-Deforming High Carbon-High Chrome Steel

For quantity production, NEOR is unsurpassed for dies. Retains a keen edge much longer than carbon or high speed steels. NEOR hardening penetrates to the center of the tool and is non-deforming.

Owing to its remarkable resistance to abrasion, NEOR is ideal for gages.

Furnished in Bar Stock, Forgings and Drill Rod. *Bulletin on Request.*

DARWIN & MILNER Inc.

highest grade tool steels

1260 W. FOURTH ST. **CLEVELAND 13, OHIO**

Increase Production with

CURVED TOOTH MILLING CUTTERS

Woodruff Keyway . . . Plain Mills . . . Staggered Tooth Side Mills . . . R & L Hand Shear Side Mills . . . Overlapping Side Mills.

Write for Literature

ABER ENGINEERING WORKS, INC., Waterford, Wis.

TOOL & DIE JOURNAL

Know-How Library

THE Tool & Die Journal Know-How Library is a series of manuals being prepared by specialists having the practical, shop know-how in their respective fields.

Metal working processes, techniques and materials including plastics, will be treated comprehensively and authoratively.

A number of "Know-Hows" are in preparation, and the first two are now ready. These are:

TDJ Know-How Library, Vol. 1

"BRIEF SURVEY OF PLASTICS"

by **Warren V. Prince**

A concise introduction to the leading plastics materials, molding and fabricating methods. Already in use in training programs and sales engineering conferences.

TDJ Know-How Library, Vol. 2

"ACCURACY AND THE GEOMETRY OF PRECISION"

by **E. Willard Pennington**

A historical and detailed, step-by-step presentation of the methods of generating, by scraping, master surface plates, straight edges and 30°, 45°, 60° and 90° angles.

PRICE EACH 35 CENTS, POSTPAID
Discount on quantity orders

Order from **KNOW-HOW LIBRARY EDITOR**

American Industrial Publishers
2460 FAIRMOUNT BOULEVARD
CLEVELAND 6, ◆ OHIO

New Insulation Tape

Called Miccrotape—and the first product of its kind to be produced by an extruding process—a new tape used for insulation of plating racks and for masking parts prior to selective plating has been announced by Michigan Chrome and Chemical Company, 6340 E. Jefferson Ave., Detroit, Mich. The extruding

process results in a slightly curved surface which feathers out to uniformly light edges—making the tape easy to apply, permitting smooth over-lapping and a snug fit around every surface.

When used for protection of plating racks, it leaves no pockets and there's no possibility of solutions being trapped during plating or cleaning cycles. It can be built up to any desired thickness and, by heating for an hour at approximately 300° F, will fuse into an integral coating.

Miccrotape has practically all of the characteristics of rubber and far surpasses its chemical resistance. It offers resistance to all plating solutions, including DuPond Rapid High Speed Copper 180°-190° F, Bronze, Tin, Zinc, Chrome and Cadmium, and withstands under actual operating conditions boiling hot cleaning solutions and pickling baths. It has high dielectric strength.

INFORM-A-GRAM KEY No. 997-S

Have us tell you about our

MAGNETIC CHUCKS

when you are planning your new production set up. Many of the larger Michigan and Ohio plants have proven them, and are now buying for their new tooling.

ROCKFORD MAGNETIC PRODUCTS COMPANY
1306 Eighteenth Ave. Rockford, Ill.

New Method Cuts Sprocket Machining Time in Half

The time to machine sprocket teeth has been cut more than half by a new application of the Turchan Hydraulic Follower Machine according to an announcement by the Turchan Follower Machine Co., Dept. D, 8259 Livernois Ave., Detroit 4, Mich.

A 33-tooth sprocket of 1" steel, SAE 4140, OD 21⅞" and ID 14½", as illustrated, was machined on a milling machine equipped with a Follower Attachment. The Turchan method required only 18 minutes for roughing and 13 minutes for finishing per sprocket, as compared to 75 minutes per sprocket required by the former method of operation with gear cutters.

In addition to the saving of more than one-half the machining time, the Turchan method eliminates inspection time since the inspection is done by the machine operator while the machine is in operation.

INFORM-A-GRAM KEY No. 104-S

The Tubular MICROMETER

FEATHER TOUCH

Made in 89 Different Sizes and Types

SUPERIOR MICROMETERS for "PRECISION" MEASUREMENT... A Tumico Tradition

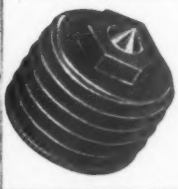
The excellence in design and the sturdy construction you find in our Tubular Micrometers is the result of over thirty years of service to the industry. Today Tumico Micrometers enjoy the world wide acceptance of discriminating workmen.

PROMPT DELIVERY

The Tubular Micrometer Company
St. James, Minnesota, U. S. A.

A REAL HELPING HAND

It's a help that die makers, tool makers, machinery builders and general machinists have long sought—a more accurate and surprisingly faster way of transferring blind screw holes.



The Heimann Transfer Screw Set is a self-contained, complete tool. No wrenches or pliers are necessary. Made in 3/16" to 1" diameters.

Send for price list.

HEIMANN MFG. CO.
Dept. T
Urbana, Ohio

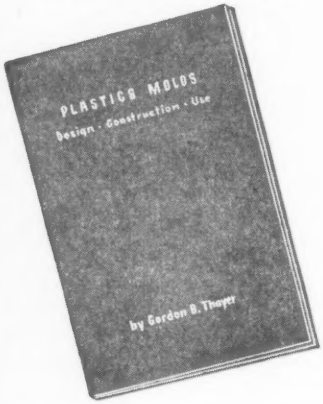
One Reason Why—

PLASTICS MOLDS

Design · Construction · Use

Second Edition

By Gordon B. Thayer



is already selling in its third reprint . . . "tool design and construction are 90 percent and material molding technique 10 percent of successful plastic molding" — a statement of a district manager of a leading material manufacturer.

"Plastics Molds", written by a practical shop trained man, is the "know-how" book that every designer in the plastics field will eventually buy.

Copies are $3.50 each, postpaid
Discount on quantities

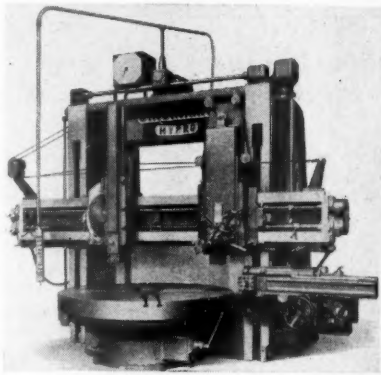
AMERICAN INDUSTRIAL PUBLISHERS

302 Fairmount-Cedar Building

Cleveland 6, Ohio

New Cincinnati Drive for Micro Mills

The Cincinnati Planer Co. has announced development of the new Cincinnati Drive for Hypro Vertical Boring and Turning Mills. It will enable the operator to maintain proper cutting speed at all times through a wide range of table speeds. These are obtained by a fine increment adjustment controlled



by a push button controlled rheostat from a pendant station.

On work of varying diameter, the table speed can be increased or decreased instantaneously without shifting numerous gear levers. The large, graduated "speedometer" mounted on top of the machine indicates the table's speed. This eliminates guessing or reading of speed plates on gear shifting boxes. Pendant push button control to the table provides smooth starting and positive stopping. The table can be "inched" or run in both clockwise and counterclockwise direction.

For extra heavy cutting and low speeds a back gear is provided. The smooth and rapid speed changes developed by the Cincinnati Drive are necessary to protect tools when hard spots or sand inclusions are encountered. Otherwise it might be necessary to run the entire cut at lower speed.

For the past year the new Hypro Mill has been put through its paces in the Cincinnati Planer Co. shop.

INFORM-A-GRAM KEY No. 55-S

New Nesting Type Tote Pans

20" long x 12" wide x 6½" deep.
16 ga., drag holes and handles both ends.
J. L. LUCAS & SON, INC.
Bridgeport, Conn.

TRIG TABLES *For Daily Shop Use*

Trigonometric functions, angle formulas, five place tables, thread elements, tap drill sizes to 6"; decimal parts, reference tables of measures; on pocket-size pages.

50¢ each or three for $1.00 postpaid.

Please send us____copies of Trig Tables.
Enclosed is $_____in payment.

HERBERT G. TAYLOR & ASSOCIATES
Manufacturer's Agent
5916 W. DIVISION ST., CHICAGO 51, ILL.

NEW CALIPER
SPEEDS UP DEFENSE WORK

Direct Reading Accurate, Fast, Simple. New timely tool SAVES TIME, SPEEDS UP PRODUCTION. Graduated scale, easily read at a glance. Adaptable to all types, shapes of work, wood or metal. Measures 0 to 4 inch.

FREE LITERATURE and PRICE on request

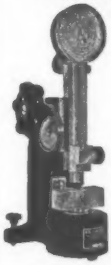
T & H MFG. CO.
811-L East 31st, K.C., Mo.

External Cylindrical and Centerless GRINDING
Quality in Quantity
J & R Specialties Production Grinding
5507 Francis Ave., Cleveland, Ohio
Phone DI. 9180

Gusher
COOLANT PUMPS

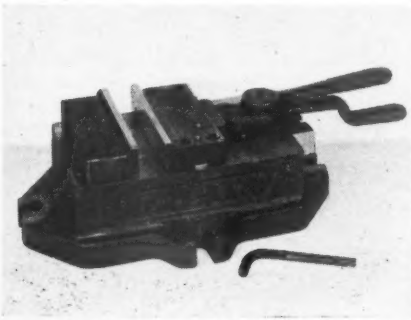
Sizes from 1/10 to 2 h. p. Pumping capacity up to 200 g.p.m. Many patented and exclusive features.
Write for descriptive literature
The Ruthman Machinery Co.
1808 Reading Rd., Cincinnati, Ohio

HARDNESS TESTING



has been done with the SCLEROSCOPE since 1907

THE SHORE INSTRUMENT & MFG. CO., INC.
9025 Van Wyck Avenue
Jamaica, N. Y.



HARTFORD MILLING VISE

The "Four-Point" Milling Vise grips and releases quickly due to the design of the cam-faced and eccentric handles. The eccentric handles provide locking with tremendous binding force. The movable jaw is a single heat-treated steel drop-forging for great strength. The jaws give absolute alignment.

Bulletin No. V-100 gives full specifications.

THE HARTFORD SPECIAL MACHINERY CO.

CONTRACT TOOLING AND PRODUCTION

Illinois

DRESEL-BETZ COMPANY
Belleville, Ill.
Designers and Manufacturers of Tools, Dies, Jigs, Fixtures, Metal Stampings

★

PRESS BRAKE DIES
and Punching
Attachments for All
Makes of Press Brakes
DREIS & KRUMP MFG. CO.
7428 S. Loomis Blvd. Chicago 36, Ill.

★

ROCKFORD DIE & TOOL WORKS, INC.
1616 Seventeenth Avenue, Rockford, Illinois. Phone MAin 3084. Designers and Manufacturers Tools-Dies-Jigs-Fixtures. Production Job Work

Michigan

DAVIS TOOL & ENGINEERING CO.
19250 Plymouth Road, Detroit, Michigan, VErmont 5-6000. Tools and Dies, Special Machinery, Sheet Metal Stampings and Assemblies

New Jersey

BERGEN MACHINE & TOOL COMPANY, INC.
189 Franklin Ave., Nutley 10, N. J. Facilities on over 200 Machine Tools including automatics and centerless grinders, open for contract work. Small and large production runs.

★

PRECISION FORM GRINDING
Specialists in grinding Circular and Flat FORM-TOOLS, FORM Counterbores, FORM Flat-Drills, and related types of FORM grinding. Also step-grinding of Tungsten and Molybdenum Rods.
Send Prints for Quotation and Delivery
J. & S. Tool Co., 477 Main St., E. Orange, N. J.
(Makers of J. & S. Radii & Angle Dressing Tools)

★

THE VIKING TOOL & MACHINE CORP.
8 Main Street, Belleville, New Jersey. Tools-Dies-Jigs-Fixtures-Molds-Gages-Machines-Stampings-Specialties

New York

Hand Screw Machine Products
UP TO 3" BAR OR CHUCK
Production Milling on Duplicate Machine Parts
Gauges, Jigs, Fixtures and Special Machines
BEAVER MACHINE & TOOL CO.
1137 W. Belden Ave., Syracuse 4, N. Y.

CONRAD & MOSER
2-23 Borden Ave., Long Island City, N. Y. Machine Tools & Molds, Parts & Machines, Aluminum Cast Parts, Aluminum Sheet Formed Housings

RANE TOOL CO., INC.
17 Ross St., Jamestown, N. Y., Phone 5934. Specialists in Blanking, Forming, and Drawing Dies

Ohio

CLEVELAND UNIVERSAL JIG COMPANY
13404 St. Clair Ave., Cleveland, MUlberry 2600
DESIGNERS AND BUILDERS
Jigs & Fixtures Special Machines
Production Engineering
Complete Plant Routing and Tooling

THE DENNING MANUFACTURING CO.
1775-81 E. 87th St., Cleveland, O., CEdar 0801. Designers and Builders of High Grade Dies

GENERAL DIE & TOOL CO.
2067 W. 58th St., Cleveland, O., WOodbine 4738. Dies, Tools, Jigs, Fixtures, Light Stampings, Special Machinery. Manufacturing

THE INDUSTRIAL MACHINE CO.
1436 East 47th St., Cleveland, O. Founded in 1908. Builders of Special Machinery. General Machine Work.

KIFFER TOOL & DIE CO.
5601 Tillman Avenue, Cleveland, Ohio, WOodbine 2440-2441. Manufacturers of Special Machinery, Tools, Dies, Jigs, Fixtures, Swiss Jig Boring

THE LORAIN MACHINE & TOOL CO.
1951 West 90th St., Cleveland, O., MElrose 5010. Designers and Builders of Dies, Jigs, Fixtures, Gages, Special Machinery, Jig Boring

NOBLE & STANTON, INC.
998 Broadway, Bedford, Ohio, Bedford 1234. Tool Makers—Specialists in Aircraft Work

PARAMOUNT TOOL CO.
1392-98 East 43rd St., Cleveland, O., ENdicott 2220. Jigs, Fixtures, Dies, Experimental Work

THE PHOENIX MACHINE CO.
2711 Church Ave., Cleveland, O., CHerry 1048. Contract Grinding, Boring and Planing. Lester-Phoenix Die Casting and Plastic Molding Machines

A. P. SCHRANER & CO.
3838 Payne Ave., Cleveland, O., HEnderson 8644. External Cylindrical Lapping Machines, Special Machinery, Tools, Dies, Jigs, Fixtures

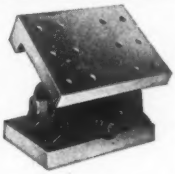
THE VARIETY MACHINE & STAMPING CO.
12096 Elmwood Ave., Cleveland, O., LAkewood 8438. Designers and Manufacturers of Dies, Metal Stampings. 250 tons capacity

★

"Plastacele" Handbook

The "Plastacele" Handbook issued by the Plastics Department, E. I. du Pont de Nemours & Co. (Inc.), Arlington, N. J., is an engineering and designing digest of data on "Plastacele" cellulose acetate sheeting and molding powders. Various steps in fabricating are detailed sufficiently for the shop or craftsman handling a first application. The designer with metal die and tool room background will appreciate the constant references to similarities as well as differences in fabricating techniques to corresponding metal parts or materials.
INFORM-A-GRAM KEY No. 859-S

McMahon Adjustable Angle Plates



Model "A" Adjustable Angle Plate with four 1/2" "T" Slots. Size, 3" x3"x3 1/2". *Price*, $14.40. Shipping weight, 5 lbs.

Model "D" Adjustable Angle Plate with 16, 5/8"x16 threads tapped holes. Size, 6" x 6" x 7 1/2". *Price*, $42.00. - - - - Shipping weight, 45 lbs.

FRANK McMAHON CO. 142 S. June Street Dayton 3, Ohio

6 DAYS DELIVERY

For first shipment on accepted orders

on

THREAD MILLING CUTTERS (Hobs)

EXPANSION and RADIAL RELIEVED FORM CUTTERS (Regular or Interrupted tooth form)

DIES

INVOLUTE SPUR GEAR CUTTERS 14 1/2°; 20° & 25° P. A.

U. S. MACHINE TOOL MFG. CORP.

Clinton, Indiana - Phone 85

Sensational new **DRILL SHARPENING GUIDE!**

Patent Applied For

EVERY MAN can now sharpen a drill right like a veteran mechanic—with help of this new device.

SAVES TIME — PATIENCE and DRILLS

GET this new device, learn to use in 10 minutes, grind drill right first time and watch drill cut through steel or iron like you've always wanted to!

Order Now! **$1.35 postpaid; $1.30 C.O.D.**

JANONE ENGINEERING CO.

1648 BALTIMORE AVE. KANSAS CITY, MISSOURI

WANTED

Engineer for product and tool design and development for small manufacturing plant in metropolitan New Jersey. Require broad experience in production of small stampings, flat springs or snap fasteners. Must be able to design modern automatic production dies. Excellent future for capable man. Statement of availability required. Write stating qualifications and salary expected. Box XYZ care Tool & Die Journal, 2460 Fairmount Blvd., Cleveland 6, Ohio.

HANDY RACKS

Now available in 4-Arm, 51" high or the new 5-Arm-Rack, 57" high. Used wherever flat or round bar stock or tubing is kept—factories, warehouses, schools, large & small shops. Four times the usual capacity for the floor or height space. Low cost, & money or space saved.

Send for priced circular.

Priority Regulations Govern Delivery

Wm. S. Yohe Supply Co.

507 Gibbs Ave., N. E.

CANTON 4, OHIO

SEND US YOUR PRINTS FOR *Quotations*

THREAD GRINDING

BROACHING

MAGNETIC INSPECTION

TAYLOR MACHINE COMPANY

MANUFACTURERS OF AVIATION & AUTOMOTIVE PARTS

Gear Specialists

1417 EAST 61ST ST. • CLEVELAND 3, OHIO

West's Positive Automatic Stop For Dies

SAVES MACHINE TIME & MATERIAL

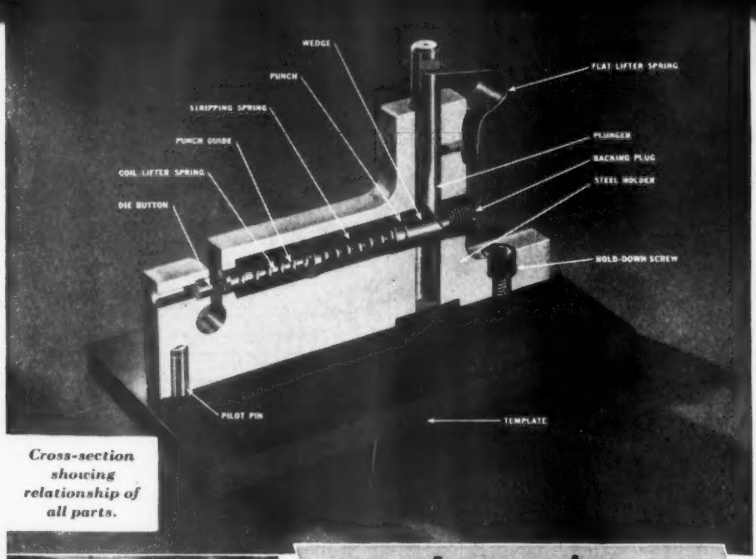
IMMEDIATE DELIVERY

Simple in Operation-Positive in Action-Easy to Install

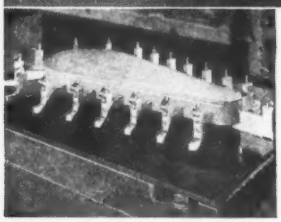
Instructions for mounting included with Stop . . . . . Price $2.00

R. C. WEST

117 Fowler Ave. • Kenmore, N. Y.



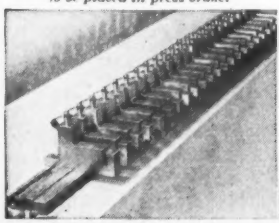
Cross-section showing relationship of all parts.



Set-up of Type "H" Units on a template with the work nested in position ready to be punched around the entire rim.

Showing Units set up without the work.

Type "H" Units set up on a rail ready to be placed in press brake.



Announcing
WALES TYPE "H"
HOLE PUNCHING UNITS

Another reason why . . . before putting holes in angles, channels or sheets BY ANY METHOD investigate WALES EQUIPMENT

These new Wales Units are designed for punching holes in flanges, angles, container sides and similar shaped and formed work eliminating expensive, single-purpose, cam-action dies.

Each Type "H" Unit is independent and self-contained to permit a group of these units to be used and reused, placed and replaced interchangeably in press brakes and stamping presses.

Before spending valuable time and effort designing and building special hole punching dies, check with Wales-Strippit engineers who may have solved your particular hole punching problems by using various adaptations of standard Wales Hole Punching Units.

As a timely suggestion, call on Wales-Strippit engineers FIRST.

Write for complete Catalog TODAY.

WALES-STRIPPIT CORP.

355 Payne Avenue

North Tonawanda, New York

(Between Buffalo and Niagara Falls)

George F. Wales, President

Specialists in Punching and Notching Equipment

GRIFFIN PROCESS is applicable on thread plug gages from ¼" up and on thread ring gages from 1" up.

GRIFFIN PROCESSED THREAD GAGES have all threads ground in a solid deposit of tough, wear-resistant chromium carbide alloy. Worn gages are salvaged by removing old threads, welding on a thick deposit of chromium carbide alloy and grinding new "on size" threads in the alloy. Thus, threads are ground in carbide from root to the crest—are not just a plated surface.

GRIFFIN PROCESSED THREAD GAGES give many times the service of ordinary tool steel gages because of the extreme wear resistance of the chrome carbide alloy. Average life increases are twenty times, depending upon the type of material being gaged. Users have reported up to 60 times more life in exceptional cases!

●

Send your old gages for reconditioning or order new gages made by the Griffin Process. Highly economical, fine workmanship, prompt deliveries! Write for our free folder describing the complete *Griffin Process* for increasing thread gage life!

GEORGE O. GRIFFIN COMPANY

1301 WEST HADLEY STREET • WHITTIER, CALIFORNIA

Chrome Carbide Thread Gages

GILRON THREAD GRINDING COOLANTS ARE TAILOR MADE

As a tailor-made suit is designed, cut and fitted to the individual, so a Gilron coolant is designed and developed by Gilron engineers to meet perfectly the particular requirements of the work in hand.

Beginning with Gilron's engineered oil as a base, each Gilron thread grinding coolant is adjusted to the material which is to be ground, the specified finish to be attained, the grinding equipment which is being used and particularly its speed and feed characteristics.

Thus production of inspection-approved work is increased and critical war products flow with less interruption.

A convincing list of satisfied users testifies to the value of this *new* Gilron development. It will pay you to investigate. Write for data unit T.

Gilron PRODUCTS COMPANY

1557 EAST 40th STREET
CLEVELAND, OHIO

SCIENTIFIC COOLANTS
DRAWING-GRINDING-CUTTING

ADVERTISERS INDEX

Aber Engineering Works, Inc.... 223
Accurate Bushing Company..... 200
Ace Abrasive Laboratories..... 215
Acme Industrial Company..... 152
Acme Tool Company.....146, 207
Acromark Co., The..... 140
Advance Foundry Co., The..... 182
Allegheny Ludlum Steel Corp..... 2
Alofs Mfg. Co..... 219
American Broach & Machine Co. 51
American Industrial Publishers 224, 226
Ames Co., B. C..... 193
Armstrong-Blum Mfg. Co..... 236
Armstrong Bros. Tool Co..... 218
Automotive Maintenance Machinery Co. (Ammco)..... 38

Barteit Engineering Co..... 197
Barth Stamping & Machine Works 221
Beaver Machine & Tool Co..... 228
Bergen Machine & Tool Co., Inc. 228
Besly & Company, Charles H.... 175
Bissett Steel Co., The..... 188
Bokum Tool Co..... 72
Boyar-Schultz Corp..... 183
Builders Iron Foundry..... 199
Bunell Machine & Tool Co.....76, 77
Burke Machine Tool Co..... 196
Busch Company, J. C..... 214

Carboloy Co., Inc..... 21
Carborundum Company, The..... 8, 9
Carpenter Steel Co., The..... 201
Catalin Corp.....124, 125
Cerro de Pasco Copper Corp..... 142
Chambersburg Engineering Co.... 48
Chicago Mfg. & Distributing Co. 61
Chicago Rawhide Mfg. Co..... 193
Chicago Screw Co., The..... 163
Chicago Wheel & Mfg. Co..... 33
Cincinnati Grinders, Inc..... 81
Cincinnati Milling Machine Co., The 80
Clark Company, Robert H..... 209
Clark Instrument, Inc..... 57
Cleveland Tool Engineering Co... 161
Cleveland Twist Drill Co., The... 86
Cleveland Universal Jig Co..... 228
Climax Molybdenum Co..... 123
Colonial Bushings, Inc..... 220
Columbia Tool Steel Co..... 222
Comtor Company, The..... 211
Conrad & Moser..... 228
Cooley Electric Mfg. Corp..... 151
Cooper-Bessemer Corp., The..... 121
Criterion Machine Works..... 185
Crucible Steel Co. of America.... 30
Cullen-Friestedt Co. 187

Danly Machine Specialties, Inc... 29
Darwin & Milner, Inc..... 223
Davis Tool & Engineering Co.... 228
Dearborn Gage Company 13
Deepfreeze Division of Motor Products Corp. 154
Denning Mfg. Co., The..... 228
Detroit Die Set Corp..... 56
Detroit Reamer & Tool Co..... 32
Detroit Stamping Co..... 63
Detroit Tap & Tool Co..... 143
De Vilieg Machine Company..... 68
Diamond Tool Co..... 219
Dickerman Mfg. Co., H. E..... 28
Die Supply Company..... 164
Douglas Machinery Co., Inc..... 159
Dreis & Krump Mfg. Co..... 228
Dressel-Betz Co. 228
Dykem Company, The..... 216

Eastern Etching & Mfg. Co..... 220
Economy Engineering Co..... 179
Electrix Corp. 14
Elliott Mfg. Co..... 219
Ex-Cell-O Corp. 55

Federal Foundry Supply Co., The 213
Federal Products Corp..... 69
Federal Tool Corp..... 127
Felker Mfg. Co..... 53
Firth-Sterling Steel Co..... 17
Fish-Schurman Corp. 184
Florian Mfg. Co..... 206
Fonda Gage Company..... 31
Ford Mfg. Co., Inc., M. A..... 7
Foredom Electric Co..... 12

Gage Company Division..... 181
Gairing Tool Co., The..... 205
Galter Mfg. Co.....170, 198
Gallmeyer & Livingston Co..... 218
General Aircraft Equipment, Inc. 67
General Die-Stamping-Tool Co... 35
General Die & Tool Co..... 228
Genesee Mfg. Co., Inc..... 34
Gibson Co., The, Wm. D..... 160
Gilron Products Company..... 232
Gorton Machine Co., George..... 169
Gottscho, Inc., Adolph..... 216
Griffin Co., George O..... 231
Grobet File Co. of America..148, 215

Hamilton Tool Co.....213, 219
Hammond Machinery Builders, Inc. 158
Hardinge Brothers, Inc..... 3
Hartford Special Machinery Co., The 227
Hartley Wire Die Co..... 217
Haskins Co., R. G..... 39
Heimann Mfg. Co..... 225
Heller Brothers Co..... 45
Hoggson & Pettis Mfg. Co., The 166
Holo-Krome Screw Corp., The.... 5
Hovis Screwlock Co..... 82

Industrial Machine Co., The..... 228

J & R Specialties Co..... 227
J. & S. Tool Co.....191, 205, 228
Janone Engineering Co..... 229
Jansson Gage Co..... 222

Kearney & Trecker Products Corp. 141
Kennametal, Inc. 145
Kiffer Tool & Die Co..... 228
Koebel Diamond Tool Co..... 221

Lapointe Machine Tool Co..... 26
Lavallee & Ide, Inc..... 78
Leach Machinery Co., H..... 213
Lee Co., K. O..... 23
Lempco Products, Inc..... 11
Lewthwaite Machine Co., T. H.. 211
Lima Electric Motor Co., The.... 52
Lorain Machine & Tool Co., The 228
Lucas & Son, Inc., J. L..... 227
Lufkin Rule Company..... 209

M-B Products 217
Madison-Kipp Corp. 180
Manufacturing Ajax Corp..... 131
Marvel Tool & Machine Co..... 59
Master Electric Company..... 199
Master Gauge Co..... 201
McGrath St. Paul Co..... 223
McKinney Tool & Mfg. Co.....18, 19
McMahon Co., Frank..... 229
Mead Specialties Co..... 189
Mercury Metal Die & Letter Co. 177
Metrical Laboratories, Inc..... 66
Merz Engineering Company..... 191
Metal Cutting Tool & Mfg. Co.. 207
Meyers Company, Inc., W. F..... 6
Michigan Chrome & Chemical Co. 186
Milwaukee Chaplet & Mfg. Co... 194
Minn-Kota Mfg. Co..... 223
Moore Special Tool Co., Inc..... 195
Moreland Tool Company..... 27

Nichols-Morris Corp. 202
Nichols & Sons, W. H..... 41
Noble & Stanton, Inc..... 228
Nobur Mfg. Co..... 174
Norton Co. 73
Numberall Stamp & Tool Co..... 214

Oliver Instrument Company..... 172
O'Neil-Irwin Mfg. Co..... 54

Paramount Tool Co..... 228
Park Chemical Co..... 83
Peerless Machine Co..... 147
Peninsular Steel Co..... 221
Phillips & Co., C. E..... 10
Phoenix Machine Co., The..... 228
Pipe Machinery Co., The..... 20
Portage Machine Co., The..... 218
Potts Machine Co..... 60
Procunier Safety Chuck Co..... 144

Production Machine Co..... 212
Producto Machine Co., The..... 192
Putnam Tool Co..... 1

Rane Tool Company, Inc..... 228
Reliance Devices Co., Inc..... 215
Rivett Lathe & Grinder, Inc..... 65
Robbins Engineering Co..... 64
Roberts Rubber Co., Weldon..... 162
Rockford Die & Tool Works, Inc. 228
Rockford Magnetic Products Co... 225
Rusnok Tool Works..... 212
Ruthman Machinery Co..... 227

Sanford Mfg. Co..... 190
Say-Way Industries 15
Scherr Co. Inc., George..... 75
Schraner & Co., A. P..... 228
Scully-Jones & Co..... 71
Severance Tool Industries, Inc.... 24
Shore Instrument & Mfg. Co., Inc., The 227
Siewek Tool Division of Domestic Industries, Inc. 43
Simpson Co., Russ..... 211
Smillie & Company, C. M..... 70
Smit & Sons, Inc., J. K..... 195
Smith Tool & Engineering Co.... 147
Somerset Industrial Diamond Co. 211
Sommer & Adams Co., The..... 235
Sossner Tap & Tool Co..... 49
South Bend Lathe Works..... 36
Springfield Machine Tool Co..... 74
Stackbin Corp. 189
Standard Electrical Tool Co..... 208
Standard Pressed Steel Co..... 204
Star Machine & Tool Co..... 84
Steel Tools, Inc..... 137
Strong, Carlisle & Hammond Co. 150
Sturdimatic Tool Co..... 44
Sun Tool & Gauge Co..... 138
Sunnen Products Co..... 37
Super Tool Co..... 167
Sutton Tool Co..... 40

T & H Manufacturing Co..... 227
Tannewitz Works, The..... 46
Taylor & Associates, Herbert G... 227
Taylor Machine Co., The..... 229
Thermo Electric Co..... 185
Tool Specialties Company..... 217
Tools & Gages, Inc..... 234
Triangle Engineering Co..... 156
Trico Products Corp..... 178
Tubular Micrometer Company.... 225
Turchan Follower Machine Co.... 157
Turner Gauge Grinding Co..... 79

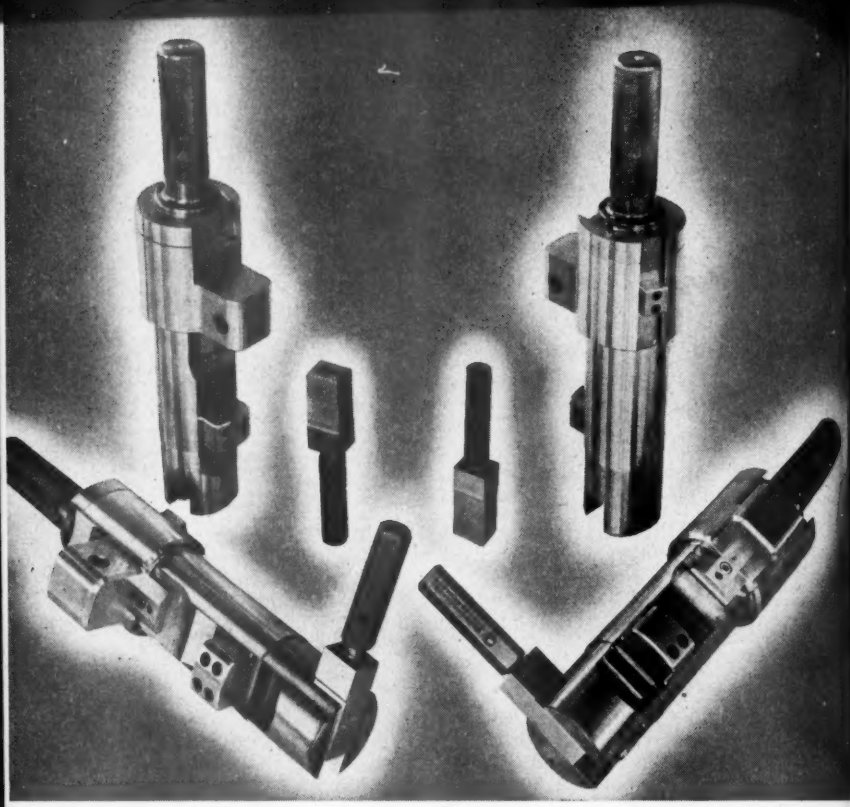
U. S. Broach Co..... 16
U. S. Machine Tool Mfg. Corp... 229
U. S. Treasury.....133, 215, 229
Universal Engineering Co..... .....50, 168, 176, 210

Vard, Inc. 153
Variety Machine & Stamping Co., The 228
Viking Tool & Machine Corp..... 228
Vimco Mfg. Co..... 213
Vinco Corp. 25

Wales-Strippit Corp. 230
Walker-Turner Co., Inc..... 42
Wall-Colmonoy Corp. 173
Walls Sales Corp..... 221
Webber Gage Co..... 135
Welding Equipment & Supply Co. 58
Wesson Products Co..... 149
West, R. C..... 229
Wheel Trueing Tool Co..... 165
Wheelock, Lovejoy & Co., Inc.... 209
Whistler & Sons, Inc., S. B..... 128
Wickman Company 171
Wilson, K. R..... 47
Wilson Mechanical Instrument Co., Inc. 208
Wittek Mfg. Co..... 62
Woodworth Company, N. A..... 22

Yohe Supply Co., Wm. S..... 229
Yost Mfg. Co..... 217
Young Arbor Co..... 206

Zagar Tool & Mfg. Co..... 197



MASTER WORKMANSHIP

Our experience as Army and Navy materiel tool and gage makers will be incalculably valuable to manufacturers when their conversion to peacetime production requires prompt delivery of dependably accurate Gages, Jigs, Fixtures and other Special Precision Tools. We also specialize in Thread Grinding. Our inspection meets the most exacting specifications.

BUILDERS OF PRECISION TOOLS — GAGES • • JIGS • • FIXTURES

TOOLS *and* GAGES

INCORPORATED

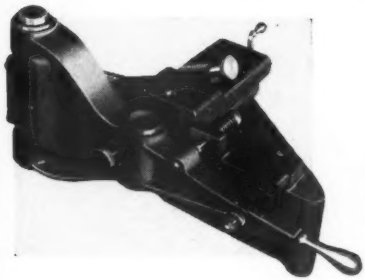
3112 EAST 63rd STREET • CLEVELAND 4, OHIO

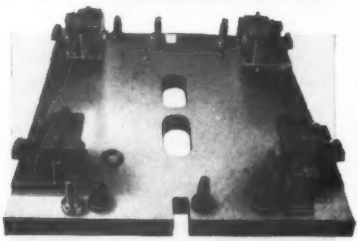
MICHIGAN 7230

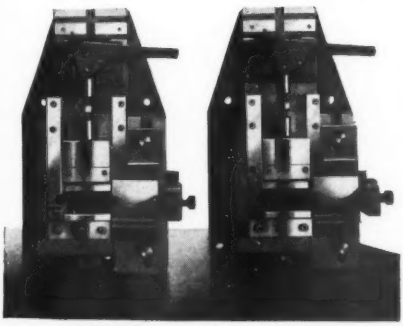
MORE *Fixtures* TO SIMPLIFY AND SPEED UP YOUR PRODUCTION

Special Delivery FROM SOMMER & ADAMS

The fixtures shown on this page are typical of many which have sprung from Sommer & Adams' more than 25 years' acquaintance with actual requirements in the field. Fixtures for checking, milling, drilling, tapping, grinding and other purposes are at your call. They are marked by interchangeability of parts, accuracy and high production possibilities.



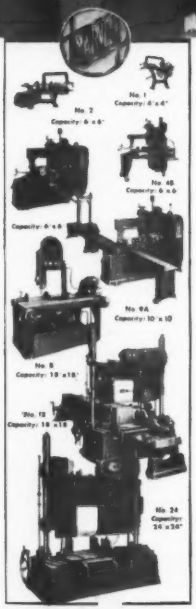




We'll be glad to help you plan your tooling program.

THE SOMMER & ADAMS COMPANY
18511 EUCLID AVENUE CLEVELAND 12 OHIO

Custom-Built EQUIPMENT FOR MANY PURPOSES



The MARVEL No. 8 does this job with ease—fast and economically

The Denver Shops of the Denver Rio Grande and Western Railroad, like numerous other railroad shops, have found the No. 8 MARVEL Universal Metal Cutting Band Saw Machine the ideal metal sawing machine. The illustration shows the cutting of floating rod bushings into three equal sections. Normally a difficult and expensive operation, this job is done on a No. 8 MARVEL Band Saw with ease, speedily and economically. No special tools, jigs, or high mechanical skill are required.

In railroad shops, as in many machine shops, tool rooms, and fabricating shops, there is a real need for a UNIVERSAL metal sawing machine that will cut the smallest, most delicate pieces as well as solid blocks 18" x 18". The No. 8 MARVEL Band Saw Machine answers these requirements and in addition will mitre, trim, notch and make re-entrant cuts.

The No. 8 MARVEL Metal Band Sawing Machine is but one machine in the MARVEL system. There is a MARVEL Metal Cutting Saw (either hack saw or band saw) for every shop's need. A local service engineer is available to survey your work without cost or obligation. He will recommend the best saw for your work, supplying accurate cost and production data. Write us asking for a call by a MARVEL sawing expert. A complete catalog is also available.

ARMSTRONG-BLUM MFG. CO.

"The Hack Saw People"

5700 W. BLOOMINGDALE AVE., CHICAGO 39, U. S. A.

Eastern Sales Office: 225 Lafayette St., N. Y. 12, N. Y.

MARVEL SAWS